

ACCOUNTING AND ECONOMIC ASPECTS OF THE
FLOUR MILLING INDUSTRY

by

ROBERT ARTHUR ANDERSON

B. S., Kansas State College
of Agriculture and Applied Science, 1944

A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics and Sociology

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1951

docu-
ments
LD
2668
T4
1951
ASS
c.d

TABLE OF CONTENTS

	Page number
INTRODUCTION	
Field of Study.....	1
Purpose and Objectives.....	1
Plan and Method of Approach.....	2
BUSINESS ORGANIZATION AND PRACTICE	
Form of Business Enterprise.....	2
Sales Contracts.....	3
Price of Flour.....	4
Invisibles.....	8
Miscellaneous Selling Considerations.....	10
Nature of Hedging.....	11
Necessity of Hedging.....	12
Operation of Hedging.....	13
Wheat Position Controls.....	15
Limitations of Hedging.....	18
Nature and Purpose of Milling in Transit.....	19
Applications of Milling in Transit.....	19
Tonnage Cancellations.....	22
PRICE AND PRODUCTION POLICY	
Problem of Output and Margins.....	23
Marginal Analysis.....	24
Classification of Costs.....	25
Application of Differential Costs.....	27
Limitations of a Cost Analysis.....	33
THE NATURE OF ACCOUNTING	
Definition and Purpose.....	34
Cost and General Accounting.....	35
Value of Accounting.....	36
Aspects Considered.....	38
PROCESS COST ACCOUNTING	
Basic Records.....	39
Choice of a Cost System.....	40
Estimate Cost Accounting.....	41
Standard Costs.....	42
Departmentalization.....	42
Causes of Variance.....	44
Estimate Cost Sheet.....	45

	Page number
GRAIN DEPARTMENT ACCOUNTING	
Nature of Operations.....	51
Causes of Variance.....	53
Wheat Control Account.....	54
Issuance of Wheat to the Mill.....	58
Wheat Account Closing Procedure.....	65
Futures Operations.....	67
Accounting for Labor and Overhead.....	68
Statement Presentation.....	70
MILLING AND FLOUR PACKING DEPARTMENT ACCOUNTING	
Nature of Operations.....	72
Causes of Variance.....	73
Accounting Procedure.....	74
Disposition of Variance.....	78
Summary.....	82
ACCOUNTING FOR BY-PRODUCTS	
Nature of By-Products.....	83
Methods of Accounting for By-Products.....	84
Importance of By-Product Control.....	85
Marketing of By-Products.....	86
Accounting Procedure.....	88
TRANSIT ACCOUNTING	
Tonnage Valuation.....	90
Methods of Valuation.....	91
Valuation Basis F.O.B. Mill.....	92
Valuation Basis Terminal.....	100
Tonnage on Storage Grain.....	103
INVENTORY VALUATION	
Nature of Inventories.....	104
Theory of Valuation.....	105
Practical Applications.....	108
PRESENTATION OF FORMAL STATEMENTS	
Nature of Financial Statements.....	129
Balance Sheet Presentation.....	130
Cost of Goods Manufactured.....	131
SUMMARY AND CONCLUSIONS	
Summary.....	136
Conclusions.....	138
Limitations.....	139

Page number

ACKNOWLEDGMENTS.....	142
BIBLIOGRAPHY.....	143

INTRODUCTION

Field of Study

There are many different types of flour mills producing many different types of flour. This particular study, although many of the problems and principles involved are applicable to other types of mills, is confined to the industry engaged in the production of wheat flour.

The study is further confined to the wheat flour production industry in Kansas. The principles and practices involved are identical in many respects and equally applicable to the industry as a whole, varying only in minor details in other states of the United States of America.

Particular emphasis is placed on the peculiarities and problems of the industry as concerns accounting records and controls necessitated by the economic aspects of the industry.

Purpose and Objectives

The purpose and object of the study is to develop accounting records and controls which will aid in the solution of economic problems of management; with particular reference to price and production policy.

Economics is defined in Webster's dictionary as, "The science that investigates the conditions and laws affecting the production, distribution, and consumption of wealth....." Accounting is defined by the same source as, "The art or system of making up or stating accounts; the body of principles underlying the keeping and explanation of business accounts. Accounting draws from the

results furnished by the bookkeeper, inferences as to the condition and conduct of the business.¹ Accounting makes available a kit of tools that may be used to aid in the science of investigating the conditions and laws affecting the production and distribution of wealth. The problem is to select and adapt the proper tools for the particular job requirements.

Plan and Method of Approach

The lack of any considerable amount of published material on the subject of accounting technique for the flour milling industry leaves but one alternative in accumulating sufficient information: that of personal interviews with men in the industry. The selection of persons and firms contacted was made with only one purpose in mind, that of cooperation in obtaining the information desired.

The results of the study are an accumulation of knowledge from personal interviews, and published, typewritten, and mimeographed material from whatever sources available. All written information is cited in the bibliography at the end of the thesis.

BUSINESS ORGANIZATION AND PRACTICES

Form of Business Enterprise

The corporate form of business enterprise is predominant in the milling industry. There are still a few partnerships but for

¹ A Merriam-Webster, Webster's New Collegiate Dictionary (Springfield, Mass.:G. and C. Merriam Company), 1949, p. 6 and p. 260.

the most part the corporation predominates.

Incorporation does not imply that stock is offered for sale to the general public on the open market. Some mill stock is offered to the public but the close corporation appears to be the dominant characteristic of the milling industry. Stock in the great majority of cases is closely held by members of a particular family or families. Even some of the largest mills in the United States are still family owned concerns.

Sales Contracts

Sales are customarily made through brokers, salesmen located in various market outlets, or by direct contact with customers through the office sales force. The use of telephone, telegraph, and teletype is extensive throughout the milling industry for selling, as well as buying, contracts.

Brokers are those who, for a fee, bring parties together and assist in negotiating contracts between them. Brokers are common factors in both buying and selling operations. In the sales connection, the broker is a contact man through whom flour contracts may be negotiated with prospective flour purchasers.

The distinguishing characteristic of mill product sales is that a large portion of flour sales are booked in advance. This practice of forward bookings is accomplished by the use of flour contracts which have been more or less standardized through the efforts of the Millers' National Federation. Contracts may call for delivery to be made within a period of as much as 120 days, or longer in some cases. As shipping directions are received by

the mill, the flour is produced and applied on the contract. Directions may be received for the shipment of all, or any portion of the flour, usually in car lots, at any particular time within the contract period. The destination of the various shipments need not be the same on all directions received.

Price of Flour

Since sales of flour are contracted in advance of production, it becomes necessary to estimate many factors of cost in advance in order to arrive at a price for the flour at the date of sale. The price of flour must provide for the cost of its production and distribution, plus a profit factor. Price must of necessity be adjusted or tempered by the prices at which other mills are willing to sell their products of comparable quality.

There are many other factors affecting the price at which an individual producer will sell flour. These are: 1. trade relations; 2. public goodwill; 3. government regulations; 4. ultimate effect of short run pricing policies on the market.

The market for flour is widespread. It extends to the corner grocery, to the chain grocery, to the small and large bakeries, and to the foreign markets. The price at which one quantity of flour is sold will not necessarily affect the price of subsequent sales. This situation has led to a widespread practice of price differentials, or differences in prices quoted to different types of buyers varying according to the quantities purchased, location, potential future contracts, and many other factors.

The value of the basic raw material, wheat, is subject to various world wide market conditions; consequently, its price will

vary from day to day and perhaps from minute to minute. The value of the by-products of flour production is also subject to similar conditions. In view of these and other factors, it has become standard procedure throughout the industry to determine flour prices by using the current market price of wheat and feed at the date of flour sale for future delivery.

As a basis for determining the selling price of flour for a given day, the sales department is furnished with cost data computed by the accounting department in which there is shown: the current price of wheat, the estimated number of bushels required to make 100 pounds of flour, the quantity and expected realizable value of by-products (based on current quotations), the material cost plus production expense of 100 pounds of 100 per cent of straight flour, and the differentials to be added for the different grades (taking into consideration the expected realizable value of resultant clears based on current market quotations).

Cost sheets similar to the one shown in Fig. 1 are used extensively in the industry for computations of flour price. In the cost sheet, the wheat price f.o.b. Kansas City is determined by reference to the closing price of Kansas City basing option for the month in which current trades are being made - May, July, September, or December. From this figure discounts are deducted or premiums added to arrive at the cash wheat price of the quality desired. This procedure is followed because it is almost impossible to determine the exact price of certain grades of cash, or spot, wheat at any particular time. This method is also convenient because the market news is readily available through such facilities as radio, The Kansas City Grain Market Review, and

COST SHEET
(Sales Analysis)

Wheat price f.o.b. Kansas City per bushel	\$2.235
Less freight per bushel	<u>.165</u>
Wheat price f.o.b. mill per bushel	<u>\$2.070</u>
Wheat cost f.o.b. mill per cwt. of flour	\$4.8645
Less feed credit:	
Bran	\$39.50 per ton sacked in K.C.
Shorts	<u>40.50</u> per ton sacked in K.C.
Total	\$80.00
Divided by 2 equals	40.00
Less safety factor	<u>2.00</u>
	\$38.00 per ton sacked K.C.
Divided by 20 equals	1.90 per cwt. sacked K.C.
Less:	
Sacks	\$0.20
Freight	<u>.27</u> <u>.47</u>
	\$ 1.43 bulk at mill
Multiplied by	<u>.41</u>
Cost of 1 cwt. of 100% flour f.o.b. mill	<u>.5363</u>
Add: Freight to destination	.80
Sacks	
Grade differential (80% patent)	.3383
Enrichment	
Cost of manufacturing, all office cost, and margin	<u>.46</u>
Selling price delivered (1 cwt., 80% patent flour)	<u>\$5.8765</u>

Fig. 1. Flour price computation.

numerous grain market publications by various grain dealers.

The freight deduction to arrive at the wheat price f.o.b. mill is the freight rate per bushel from the mill to the Kansas City basing point. Special attention is called to the freight rate per bushel because rates are stated per hundredweight. The freight rate in this case is $27\frac{1}{2}$ cents per cwt. of $16\frac{1}{2}$ cents per bushel (60 pounds).

The common unit of measurement of flour in the industry is 100 pounds. By experience it has been determined that, on the average, 2.35 bushels of wheat is required to produce 100 pounds of flour. Wheat cost, f.o.b. mill, is the result of multiplying the wheat price f.o.b. mill by 2.35, commonly referred to as the standard yield. In other words, the yield of 2.35 bushels of wheat is 100 pounds of 100 per cent straight flour.

The feed or offal credit is self explanatory. It should be noted, however, that the method is approximate in that an average market price of feed is computed, assuming that equal amounts of bran and shorts will be produced. Experience indicates that of the 41 pounds of feed produced from 2.35 bushels, approximately 60 per cent will be bran and 40 per cent shorts. Another approximation is made when the bulk mill price of feed is multiplied by 41 per cent. This per cent is based on the assumption that 41 per cent of the wheat ground will be taken off in feed. A closer approximation reveals that 2.35 bushels of wheat will produce 100 pounds of flour and 41 pounds of feed or $\frac{41}{141}$ of 100 per cent feed.

Feed prices are quoted at so much per ton sacked f.o.b. Kansas City, thus the conversion to hundredweights sacked at the mill and the deduction for freight to Kansas City and the cost

of sacks to arrive at a price bulk at the mill.

The cost of 1 cwt. of 100 per cent flour f.o.b. mill actually includes only the cost of wheat in the flour after deducting the estimated recovery in by-products. To this cost must be added other costs, some of which are listed in the sample cost sheet. If the sale is made of flour other than 100 per cent straight grade the grade differential would be added, as indicated in Fig. 1, before arriving at a delivered selling price of one hundred-weight of a particular flour.

The details of the computation to arrive at the grade differential in the cost sheet are indicated below:

Cost of 1 cwt. of 100 per cent flour f.o.b. mill	\$4.2782
Less: Credit for clear flour (f.o.b. mill less safety factor)	
1st clear 15 per cent @ \$3.20 per cwt.	\$0.48
2nd clear 5 per cent @ 2.10 per cwt.	.105 .585
Cost of 80 per cent of 1 cwt. of 80 per cent flour f.o.b. mill	<u>\$3.6932</u>
Cost of 100 per cent of 1 cwt. of 80 per cent flour f.o.b. mill (3.6932 - .80)	\$4.6165
Cost of 1 cwt. of 100 per cent flour f.o.b. mill	<u>4.2782</u>
Grade differential for one cwt. of 80 per cent patent flour	<u>\$0.3383</u>

The same formula can be followed to arrive at the differential for any other percent of patent flour, using the percentage of patent desired instead of the 80 per cent indicated in the illustration.

Invisibles

A second glance at the method described for the determination of flour price will indicate many sources of invisible gains or losses when the flour contract is filled.

Prices of wheat feed and clears are subject to fluctuation

between the booking date and the date of the grind. Partial protection against wheat market variation is afforded the miller through operations in the futures market. This method of risk shifting is referred to as hedging and is discussed in a subsequent section. Feed and clear sales are often booked in advance but the practice is not as common as flour bookings. If feed and clear production are booked at the approximate time that flour is sold on forward contract, price insurance is obtained simultaneously by hedging operations in the wheat futures market. If feed and clear production are not booked in advance, another possible means of protection against market fluctuations in feed prices is the use of the millfeed futures market. The market, to date, is not well enough established and, consequently, not strong enough to afford as reliable a hedge as the wheat futures market. Not enough dealings are made in millfeed futures and the market is subject to violent changes in price, not related to prices in the cash market.

Not only the price of wheat, feed, and clears but also the quantity of actual units produced as compared to the estimates, will cause gains to be realized or losses to be sustained. The actual yield may be considerably under or over the standard used in the cost sheet. In other words, it may take more or less wheat than anticipated to produce a hundredweight of flour thus causing a variance in wheat cost. The effect does not end here; the use of more or less wheat will cause a variation in the actual feed produced as compared to the cost sheet estimate. More wheat used will produce a greater amount of offal; less wheat used will have the converse effect of less offal available for disposal.

As pointed out above, the by-products may be prepared for

sale in a variety of ways in order to take advantage of favorable market conditions. The cost sheet calculations assume that bran and shorts will be sold in one way only.

Other variations between actual and estimated costs, and profits, are noted in the cost of sacks, manufacturing and the other costs, and even in freight charges to destination. The latter circumstance arises from the freight rate structure to be explained under the heading of "Milling in Transit".

Miscellaneous Selling Considerations

The method of payment in the flour milling industry is characterized by the prevalent use of bank drafts. In the case of a shipment of goods, the draft is usually drawn by the drawer (maker) on the drawee and attached to the bill of lading. The draft with the bill of lading attached is sent to the drawee's bank which acts as the collection agent. The buyer may then pick up the bill of lading (title to the goods) by accepting the draft which is charged against the drawee's account by his bank and the remittance is then made to the drawer's bank (the payee) and subsequently credited to his account. This is the general plan in the use of bank drafts, the procedure varying in minor details depending upon the desires of the seller and/or buyer.

A few of the smaller mills with a predominant family flour trade still make sales on open account, usually for a 30 day period. This practice is still used to some extent in the larger mills but the practice is not prevalent throughout the industry.

Returns and allowances may be made to customers for short shipments, damages in transit, grade substitutions, and so forth.

These conditions are held to a minimum by careful production specifications, car loading reports, and meticulous efforts to rid transit cars of infestation and unsanitary conditions. Damages in transit requiring reimbursement to the buyer usually gives the seller a claim against the transporting company. These claims customarily receive immediate attention by transportation lines.

Contract cancellations are no longer a common occurrence in the industry. Suitable provisions for these eventualities must be made by mill management.

Nature of Hedging

Simultaneous buying and selling of the same commodity with a view to eliminating the possible profit or loss arising from fluctuations in market prices of the commodity bought or sold is known as hedging. A hedge can be described as a contract to purchase or sell in the future market at the same time that a transaction is made in the cash market for the same product.

Hedging is promulgated only if there is an organized market for future trading. The principal features of the ordinary exchange are that it does not buy or sell products as an organization but it provides a place in which trading can be carried on.

The essence of trading in futures is that a contract is entered into, by means of which one party agrees to deliver a certain amount of the product at a future time and at a stipulated price, whereas the other party agrees to accept at that future time and price.

There is a normal relation of cash to future prices for commodities which corresponds to the cost of carrying cash grain to

the future month. This normal relationship does not always prevail, but if prices are not too far out of line it is still possible to make use of the futures market to avoid risk.

Necessity of Hedging

One of the important features requiring constant attention in the operation of a flour mill is the elimination, in so far as possible, of the speculative elements inseparable from the ownership of grain. Wheat is the principal raw material of the miller and market prices of grain are subject to daily fluctuations. A speculative risk is assumed on every purchase or sale and this must be eliminated if the business is to be subjected to no more than the normal variations in results incidental to the manufacture of flour and its by-products. If the grain necessary to fill a flour booking is purchased by the miller when the order is accepted, the transaction involves no speculative risk for the miller. For a variety of reasons, however, it is not always advisable or practicable for the milling company to cover its grain requirement in the cash, or spot, market. If the available storage facilities are inadequate to store the needed quantities of grain or if the particular grade of grain required by the company is not available for immediate delivery, the purchase of cash grain may be deferred temporarily and the company will assume a short position on cash grain. On the other hand, it may be advisable to purchase cash grain in advance of customers' orders for flour which places the company in a long cash wheat position. During the heavy wheat production months the miller is usually long in cash wheat due to

the fact that he will buy during the period of movement to the eastern markets in order to get "the pick of the crop".

A long or short position places a milling company in a speculative position and for the most part the miller of flour is not a speculator. If the market prices of grain decline when the position is long, there exists the possibility of sustaining losses or reducing the normal margin of profit on the subsequent sale of flour at prices based on grain prices below cost, while if the position is short losses may arise or the normal margin of profit may be reduced, due to the purchase, in a rising market, of grain at prices in excess of those on which the selling prices of flour were based.

Operation of Hedging

The mechanics of hedging operations is illustrated by the following quotation from Fred E. Clark's Principles of Marketing:

The miller may buy wheat in September to manufacture into flour to be ready for sale in April. If at the time he buys the grain he can sell the flour for April delivery, the contract of sale will assure that profit will result from his manufacturing operations, assuming that he sold at a price which would net a profit on the milling operations. Again, he may sell flour for future delivery, estimating the costs on existing market prices. He can then go into the market at the same time and buy wheat for future delivery. In either of these cases the profits are protected: in the first against a fall in the price of flour; in the second, against a rise in the price of wheat. But if a miller buys wheat in September to manufacture into flour and does not sell the flour for future delivery, the price of flour may fall before he sells. To protect himself against such a loss he may hedge by selling wheat for future delivery. Because flour prices and wheat prices tend to follow each other, any loss from the sale of flour will be made up by his wheat transactions, for, since the price of wheat will normally fall an equivalent amount, he can buy in his

future for less than the price at which he sold it. Again, if he sells flour for future delivery, and has not purchased wheat, he may hedge by purchasing wheat for future delivery. If the prices of flour and wheat go up in the meantime, a loss will result when he sells his flour. But he can sell the wheat he purchased at the higher price and thus offset his loss on flour.

These transactions need further explanation. It might be assumed that since the miller bought wheat when he sold flour, he would use that wheat to make the flour. But this cannot, as a rule, be done. In the first place, his wheat may be delivered at any time during the future month, whereas he may want to begin milling on some certain day in that month or sometime before. In the second place, he will receive low grade wheat of any one of several grades deliverable on future contracts. But he must have a certain quality of wheat to make the kind of flour he has agreed to deliver. When he wants to begin milling, consequently, he can go into the cash market and buy the quality of grain he wants -- in the case under consideration, at a higher price than that on which he based his flour bid. Hence he loses money on this part of his operations. But at the time he buys wheat to mill, he sells out his future, at a higher price than he agreed to purchase it for. This profit offsets the loss on the high priced wheat he bought to grind. In this way he protects the profit on his milling operations.¹

In order that the operation of hedging be further clarified the following conditions are assumed. Assume that on September 1st, a company purchased 5000 bushels of cash wheat at \$2.00 per bushel without receiving a simultaneous order for flour. In order to eliminate, insofar as possible, a speculative position, the company entered into a futures contract for the sale of 5,000 bushels of wheat for December delivery at \$2.05 per bushel. One month later a flour sale was booked requiring 5,000 bushels of wheat to fill. At the date of sale December futures were quoted at \$2.03 per bushel and the market price of cash wheat (assuming that both markets moved in the same direction) was \$1.97 per

¹ Fred E. Clark, Principles of Marketing (New York: The Macmillan Company), 1933, pp. 426-427.

bushel. The company would then close the futures by buying in futures for less than the price at which it was sold. The company would then show a loss of \$150 due to the decline in the market value of the 5,000 bushels of wheat on hand, purchased for \$10,000 and now worth \$9,850. But this loss would be offset by a profit of \$150 on the futures sale because the company could purchase, at the time of the flour sale, in the futures market at \$2.02 per bushel the 5,000 bushels of wheat to cover the sale of 5,000 bushels it contracted to sell for \$2.05.

Although futures trades are finally closed by delivery of the grain stipulated in the contract, it does not necessarily follow that such delivery is effected by the original seller to the original buyer. Before the final delivery date the same grain may have been bought and sold many times. Thus, in the above example, when the purchase of 5,000 bushels in the futures market was consummated at the date of the flour sale, the futures trade was thereby closed, and the company could collect \$150 from the clearing house for the profit on its trades.

Wheat Position Controls

The problem of keeping a balanced position as to wheat and the availability of certain grades of wheat to fill flour contracts is controlled by the preparation of two reports: the long and short and the position statement. The latter is simply a report used to supply accurate information daily, or oftener, as to the availability of wheat supplies in relation to flour sales. This report requires an analysis of flour sold by grades and the grades

of wheat required to fill these contracts, as well as a run down of wheat stocks by grades available to the milling department.

The long and short report will be explained in detail. The purpose of the report is to supply a means of control over the cash and futures position with reference to keeping the position in balance (neither too long or too short). The report covers all wheat transactions between the opening of the market one day and the opening of the market the following day and is prepared each morning prior to the market opening to determine the net long or short wheat position.

The report is set up with debit (long) and credit (short) columns. The first entry is the previous day's net closing position. Then follows the Debits: Cash wheat purchases, wheat futures purchases, and flour purchases (in wheat equivalent); and the Credits: Cash wheat sales, wheat futures sales, the net flour sales (in wheat equivalent). The two columns are totaled and the net position determined.

When the long and short has been completed, a new form for the current day's business may be started immediately, and the grain executive can accumulate thereon during the day the purchase and sale transactions for his guidance during the market session. This form is not completed, however, until the following morning. The net long or short position is of such importance in the success of the enterprise that the mill management must have this data currently for buying and selling policy determination.

The long and short is not self-checking and should be verified periodically, and adjusted if necessary, against inventories

of grain, unfilled flour contracts, flour inventories, and a confirmation of position in the futures market. A daily futures position report is a necessary control device when dealing with more than one future month or futures markets. This report shows the mill's net position in each market month to guide the grain executive in executing further trades during the market session. The balance in each market month at the beginning of the session is brought forward and space is provided for the entry of trades accomplished during the session.

Futures settlement records are another means of check and control. The financial records on futures transactions perform a threefold function: 1. They make possible proper control over margin advances to the brokerage firm handling the trades. 2. They furnish the necessary figures for verifying the purchase and sale settlements. 3. They provide the required data for the computation of profit or loss on open trades at the end of the accounting period.

The long and short report in its simplest form is illustrated in Fig. 2.

LONG AND SHORT REPORT

Date _____

	Long (Debit)	Short (Credit)
Yesterday net closing position		
Current transactions:		
Cash wheat purchases	XX	
Wheat futures purchases	XX	
Flour purchases	XX	
Cash wheat sales		XX
Wheat futures sales		XX
Net flour sales (booked today less contracts filled)		XX
Total	<u>XXXX</u>	<u>XXXX</u>
Net long or short	<u><u><u><u></u></u></u></u>	<u><u><u><u></u></u></u></u>

Fig. 2. Computation of net position

Limitations of Hedging

Hedging does not remove all danger of loss. For example, when flour is sold and the grain executive goes into the future market to buy in his future, a slight variation in the spread between cash and future prices (as compared to the time that the futures were sold) may cause him to lose or gain.

The mill manager cannot hedge the premiums or discounts, neither can he hedge possible contract cancellations. The future market does offer him a means of minimizing risk, and losses

should be considered as the price of insurance while any realized gain is a partial recovery of the cost of wheat.

Nature and Purpose of Milling in Transit.

Transit freight arises from a system of freight charges made by the railroads. Transit is based on the theory that a commodity is sent from point of origin to ultimate destination as a through shipment with the privilege of subjecting it to some process at an intermediate point. The entire practice of transit rests upon the fiction that there is a through movement, when, from the operating standpoint, there are actually two or more separate and distinct local movements. The through rate is preserved on the theory that the contract of carriage is merely suspended until the commodity in its original or manufactured form is again returned to the carrier for transportation to final destination. Transit implies substantial identity of incoming and outgoing products, but in cases such as the milling of grain into flour the two different commodities move under one rate.

The basic principle of transit privileges is, generally speaking, to place such industries as are handicapped as to location more nearly on a parity with those better situated. To put it another way, transit arrangements are made to effect an equalization of freight charges and to eliminate discrimination.

Applications of Milling in Transit

A miller may purchase wheat from any source he sees fit, and transport it via rail with as many as three, or possibly more,

stop over rights for the purpose of storage and processing, over a period of as long as two years. This privilege offers the miller an opportunity to purchase wheat, ship it to a terminal, mill it, and ship it on to the buyer on a through rate origin to destination.

When cars of wheat, purchased and ordered shipped to the mill, arrive at the mill, the railroad will render a bill for the standard rate from origin to mill. This charge is then a transit item because the miller intends to ship the products of that wheat on to the buyers of flour and by-products. The transit freight he has paid may be applied to any shipment in the future. The railroad is informed as to the origin of the shipment being made in order to determine the through rate from origin to destination. The mill is then billed for the freight less the transit being applied to that particular shipment.

The system of freight rates, as it concerns the country as a whole and the milling industry as a whole, is such a complicated matter that a detailed explanation of it would require a long and complicated analysis in itself. It must be remembered that transit has been a gradual growth and has developed along the lines which often appear illogical.

The freight rates and a method of wheat pricing were set up on the accepted fact that transportation is one of the important cost factors going to make up a delivered price on flour or feed. Grain and grain products rates are made in relation to and with particular regard for the general flow of wheat and flour in the course of their normal movement.

For Kansas and Colorado, Kansas City is the market and wheat

products are priced basis Kansas City. Since all wheat of comparable grades comes to a common value at Kansas City, a very carefully worked out system of proportional rates applying from this market has been created: a system which sets definite and constant relationships as between various competing territories.

Throughout the country the rail carriers have been liberal in the routes which they have established. Liberal routing permits a mill to draw wheat from a larger territory and also creates a larger territory in which a mill can distribute its products. This larger drawing territory enables a miller to purchase the quantity and quality of wheat he needs to permit him to make a uniform flour from year to year.

Without milling in transit there would be no equality in transportation charges and two mills located at different points on the same route would not be on a competitive transportation basis, even though they used wheat from the same origin and shipped flour to the same destination. The milling in transit privilege is perhaps the best example of the lengths to which the carriers have gone to create a system of rates that will permit a widespread industry to work on a competitive basis.

Shipments are usually made in car load lots in order to qualify for cheaper rates. Freight tariffs now provide for minimum carload weights on flour of 60,000 pounds. If the car is under this minimum, freight charges are nevertheless assessed on the minimum weight.

The transportation factor is of such importance to the milling industry that all milling territories and markets now maintain

experienced men whose duty it is to constantly watch over and protect the interests of their particular locations in transportation matters. The man responsible from this angle in a mill is commonly known as the traffic man or traffic officer. It is a recognized fact that under present conditions, a traffic man can "make or break" a mill merely by his knowledge, or lack of it, in making transit applications.

Tonnage Cancellations

The amount of tonnage which a mill has on hand at any given time would, if all wheat were received by rail and all flour shipped out by rail, correspond very closely with the amount of wheat and flour stocks at the mill. Any small differences existing would be the result of moisture change and handling losses. However, if any considerable volume of shipments from the mill are made by trucks or vessel (on which tonnage cannot be utilized), the tonnage on hand may be substantially greater than the stocks of wheat and flour. The rail tariffs require that an excess of tonnage must be cancelled at a specified time or times during each crop year. It is, of course, important to avoid such cancellations insofar as possible, as this constitutes a relinquishment of valuable assets. Where cancellations would otherwise be large, they can be avoided or minimized by arranging to receive flat wheat at the mill by truck or vessel to offset the volume of shipments from the mill by these types of transportation.

One other form of tonnage cancellation is provided in the carriers' tariffs. On the theory that the process of storing and

milling wheat normally results in a loss of product weight, the tariffs require an arbitrary one per cent tonnage cancellation on each application against any outbound movement. This form of cancellation can be avoided to the extent that the miller is able to submit proof that such a loss did not occur in the period under consideration.

PRICE AND PRODUCTION POLICY

Problem of Output and Margins

The price and production problem is a very real one to any mill manager. Particularly since he has so many variables that affect his operations. During periods in which he can sell all of his output on a margin which will leave him with satisfactory profits the problem may not be so real and pressing to him. But in an industry with as much potential capacity as flour milling, competition is bound to necessitate efficient operations and careful planning for those who expect to continue profitable operations.

The problem of price may boil down to only one problem: How much will the market bear, considering competition? If this is the problem and some suitable answer is available the next question is: Can I afford to make a particular sale, or on the other hand can I afford to turn it down?

Pricing is not simple, and the milling business is no exception. Products must be sold to many different types of trade and many different products are made available to buyers. Quality selling is preferred to strictly price selling. But be that as it

may, practically the same cost product can be sold at varying prices at the same time.

A mill with a good family flour trade is in a favorable position to make a profit since the largest margins are usually obtained in that market. But few mills can sell their capacity through that outlet or even operate profitably on family flour alone. The problem remains: At what price must a sufficient portion of potential output be sold in order to realize a profit from operations?

Production and price policy are inseparable. One is dependent on the other. If the price is set for the product, by the seller, he must accept the fact that only a certain quantity can be disposed of at that price. If it is determined that a certain quantity is to be sold the seller must be prepared to accept only certain prices for that quantity. To operate at a point which will maximize profits or minimize losses, some estimates must be made as to quantities and corresponding prices.

Marginal Analysis

A marginal analysis attempts to analyze and compare increments and decrements in total cost and total revenue occasioned by a small (usually one unit) increase or decrease in the number of units produced and distributed. An attempt is then made to determine the optimum output. This output is determined at the point (assuming there is only one) where marginal cost and marginal revenue are equal. Optimum output is that level of production

which will maximize profits or minimize losses. A comparison of average total costs at this level will indicate the profit or loss per unit.

A differential cost analysis makes use of the marginal approach which is very useful in determining the most profitable output. Differential cost may be defined as the increase or decrease in total cost occasioned by an increase or decrease in units produced and/or sold. It is obvious that any analysis of increments in cost is absolutely useless without a knowledge of increments in total revenue but the logical starting point is an analysis of costs, which can be estimated without reference to revenue.

As a problem of cost accounting, differential costs are used primarily in guiding decisions yet to be made. Not only the problem of profit maximization or the minimization of losses but legislation such as the Robinson-Patman Act, creates a problem of the relationships between price and cost differentials. The act prohibits differences in selling price that are greater than differences in cost. If differentials in price are granted to certain customers, the burden of proof of differences in cost falls on the seller. Differential costs may be used to prove the savings.

Classification of Costs

The usefulness of differential costs depends upon the reliability and degree of accuracy used in breaking costs down into their respective classifications. The acceleration of production causes some costs to be increased and others to be decreased.

It is the combination of the favorable and unfavorable factors of production that determines differential costs at a particular level.

For purposes of analysis, cost classifications must be defined as they will be used and referred to since there is no perfect uniformity in common usage.

Closed door costs are all costs which will occur even though no operations are taking place. These costs may be referred to as closed fixed costs, which are the only theoretically absolute fixed costs since all other costs can be eliminated by shutting down the plant completely. Such costs would include that portion of depreciation (to include obsolescence) which occurs even though the plant is shut down, insurance (which will be reduced in the case of mills because of relief from the necessity of inventory insurance), taxes, caretakers' salaries, and a certain portion of executive salaries unless it is intended to close the doors permanently. Consideration should also be given to the cost of losing established trade and the migration of labor if the shut down is only temporary. An analysis of closed fixed costs is particularly applicable in an analysis concerning multiple unit operations, when decisions must be made relative to probable results if: 1. All units are operated full 7-24 hr. days. 2. All units are operated on a part time basis. 3. Specific units are shut-down temporarily. 4. Specific units are shut-down permanently until next crop year, or longer.

Going fixed costs are, however, the most important fixed costs to be analyzed because the main consideration is generally how to stay in business. Going fixed costs are defined as costs

which remain constant throughout the entire range of production within the existing plant facilities.

Semi-fixed costs are those costs which remain fixed throughout a certain range of productive activity but will change when another range is considered.

Variable costs are those costs which vary directly, or nearly so, with production. Direct variation does not imply a variation at a constant rate. It is sufficient, to come under this classification, that the costs vary directly; viz.,--increases in production will cause an increase in variable costs, decreases in production will cause a decrease in variable costs. The rate of variation may be constant, increasing, or decreasing: for example: as output increases, input of variable costs increases, within a certain range of production the variable costs increase at a constant rate; within another range, the variable costs increase but at a decreasing rate; beyond a given output, variable costs increase at an increasing rate.

Application of Differential Costs

The first step in preparing a differential cost analysis is to prepare anticipated costs for the different levels of production within existing plant capacity. It is well to note that the cost analysis should be a careful estimate of what is likely to take place, not a rough guess of what may be or what is hoped for. Another note of caution is to prepare costs to include a complete business cycle, probably a year, then a breakdown can be made for an operating period such as a day, week, or a month.

A satisfactory starting point is a chart of accounts which gives a preliminary, orderly organization of costs. Recognizing the fact that the price of the principal raw material, wheat, cannot be anticipated with any great degree of accuracy for any future date and also that the offal credit which may be allowed is subject to the same difficulties due to market conditions: it is expedient as well as practical to confine the differential cost analysis to a comparison of differential costs of conversion at different levels of production and anticipated margins for conversion in flour sales.

The differential cost statement can be made up (and should be) on a 4, 5, 6, or 7 day week basis, for purposes of comparison. Decisions relative to the number of days per week to operate may be made from such an analysis when considered in conjunction with forward flour sales and expected bookings. Another variable to consider is the number of hours to operate per day; viz., continuously, 16 hour, or 8 hour days, for example. Possibly the latter question can be answered without any detailed analysis in many cases, recognizing that there are certain costs associated with any temporary shut down which are eliminated by continuous operations; efficiency of the mill and so on.

For illustrative purposes, assume that costs have been segregated by another analysis and the information presented in Fig. 1 has been accumulated. Note that no attempt has been made to present costs in an accurate manner as far as actual mill costs are concerned; however, the principles are applicable regardless of the figures to which they are applied.

It will be noted that the analysis is made on a going concern basis. In other words, costs are analyzed on the assumption that the mill will not shut down. This is evidenced by the fact that a portion of the cost of labor in the production department is considered to be fixed which could be considered as semi-fixed or variable if contemplation of a shut-down was a reality. Labor under the fixed classification includes provisions for a skeleton crew needed for maintenance, supervision and productive activity at the lowest level of production assuming the mill will not be shut down; for illustrative purposes, a second miller, a maintenance man, a packer, and a loader.

Additional permanent labor would be required only within certain ranges of activity, constituting the semi-fixed classifications. Variable labor would include such workers as those required on a part-time or hourly basis, depending upon the level of output contemplated.

Labor in general is a semi-fixed cost, that is, the cost of labor per unit will vary inversely with production up to a certain point, then the cost will increase with the increase in production of one more unit. Beyond that point, cost will vary inversely through another range of production and so on. Labor may be a fixed cost within a limited range of production but that fixed cost will vary in amount as production falls within different ranges.

Certain costs normally included under the overhead caption require further explanation. Depreciation is usually classified as a fixed cost but it seems that it would be well to divide depreciation into more than one category. For example: it costs

more to use equipment (disregarding obsolescence for the moment) than it does to leave it idle. Depreciation, as it is usually thought of, should then be divided into a fixed depreciation for idle facilities (age and action of the elements) and user cost scales upward according to the number of units produced during a period. Obsolescence is generally included as a factor in determining depreciation. Obsolescence is a cost which is nearly impossible to predetermine accurately, but a provision must be made for this cost on the best estimates possible from past experience.

Due to the very complex pricing system for mill products, there is no necessity in proceeding further with a differential cost analysis until sales are contemplated, except as a basis for immediate policy decisions. There are so many situations that arise that an attempt to anticipate them all is futile. This does not, however, nullify the usefulness of the differential cost analysis; on the contrary, its usefulness is enhanced by the fact that its use is not limited, but extremely flexible to meet varying conditions.

Referring to Fig. 1, and assuming certain conditions which are at least imaginable, the application of differential costs is easily illustrated. First, assume that unless 500 sacks a day are produced, the mill should be shut down, but management has no intention of closing the doors. Further, assume that the local market will absorb 500 sacks a day at a margin for conversion of \$1.05. The total margin for conversion from the sale of 500 sacks at \$1.05 will be \$525. A comparison to total cost of conversion and selling expense reveals that operation can be continued only at a loss

THE X COMPANY

Statement of Differential Costs

(Daily production 5-24 hour day basis)

(Ranges of production in sacks - 1 cwt.)						
	500	1,000	1,500	2,000	2,500	3,000
Labor:						
Going fixed costs	70	70	70	70	70	70
Semi-fixed costs	150	150	150	150	200	200
Variable costs	10	15	20	25	30	35
Overhead (to include factory overhead as well as an allocated portion of the administrative costs):						
Going fixed costs	300	300	300	300	300	300
Semi-fixed costs	50	50	50	100	100	100
Variable costs	50	100	150	200	225	250
Total manufacturing costs	630	685	740	845	925	1,155
Selling expense	100	200	300	400	450	500
Total cost of conversion and selling expense	730	885	1,040	1,245	1,375	1,655
Differential costs	155	155	205	130	280	80
						1,185
						1,235

Fig. 1. Differential cost statement.

of \$205; this is only a starting point. Perhaps the local feed market is particularly active and an invisible gain can be realized from feed production, or some other circumstance may indicate that a part of that loss will not become a reality. In other words, the margin for conversion may be more than \$1.05.

Before proceeding further with the illustration, it is essential that the method of arriving at the differential costs is thoroughly understood. Differential costs were determined by the difference in total cost at one level and the immediately preceding level; for example, at the 1,000 sack level, total costs are indicated to the \$885. Total costs at the preceding level, 500 sacks, are \$730. The difference, or the differential cost, is \$155.

Assuming that the mill in question is producing at the 500 sack level, under indicated conditions, it becomes apparent that any opportunity to sell additional flour on a margin exceeding 31 cents per sack ($\$155 \div 500$ or $310 \div 1000$) will better the firm's position as long as production is not extended beyond 1,500 sacks daily.

The illustration can be extended to include any set of conditions by using the same principle involved above.

The important thing to recognize in a differential cost analysis is that, assuming any given level of output, any opportunity to increase production and sales will better the concern's position so long as the increase in the total margin for conversion is larger than the resultant increase in cost of conversion (differential cost). Caution must be used in assuming that a betterment of position will guarantee a profit. Referring again to Fig. 1,

the company would not make a profit at the 1,500 sack level unless the 1,000 unit increment is sold on a margin considerably above the 31 cent figure (anywhere above 51½ cents); however, the question is not always whether or not a profit can be made but what course of action will minimize losses.

Whenever a possible sale presents itself (using differential costs analysis) there are but three questions to be answered before a reasonable decision can be made: 1. At what level of output am I now producing? 2. At what level will the anticipated sale allow me to produce? 3. Will the margin for conversion on this sale cover the differential cost of conversion?

Limitations of a Cost Analysis

The author does not wish to convey the idea that cost is by any means the only factor to be considered in making business decisions. Various intangible factors of trade-relations, public good-will, governmental regulations, and ultimate effects of short-run price policies on the market must be reckoned with. Any solution, arrived at by the use of cost analysis, should not be considered complete without further consideration of the so-called intangible factors.

A differential cost analysis is no better than the estimate contained therein and an adequate system of obtaining actual cost data is essential to determine variances between actual and estimated costs, not only to judge past performance but as a guide to future planning.

It has already been suggested that there are many variables

inherent in the milling business. Not only will there likely be variances between actual and estimated differential costs, but also variances between actual and estimated margins for conversion which are used in making decisions as to price and production policy at the time forward flour sales are contracted. Adequate cost control is again essential.

Accounting is thus an invaluable tool to be used as an aid to economic analysis. The remaining sections have been devoted to the development of a system by which analytical information can be obtained through the use of accounting.

THE NATURE OF ACCOUNTING

Definition and Purpose

Accounting deals with the collection, recording, verification, presentation, interpretation, and the analysis of information concerning the revenues, costs, profits, losses, and financial condition of productive units. The purpose of accounting is to provide such information in order that the efficiency of the productive unit may be measured and increased.

In order that a complete record of the financial transactions of a business may be presented and be available for presentation and interpretation, each transaction must be analyzed at the time of occurrence and be recorded according to a predetermined plan. These recorded facts must then be presented in such a form that the data will be significant to all parties concerned. Interpretation involves an explanation and analysis of significant

factors contained in the facts presented.

Cost and General Accounting

Accounting has grown with the growth of business; it has been constructed and reconstructed to meet growing needs. Accounting has developed from the simplest form of single entry book-keeping to a detailed, double entry system of checks, balances, and controls as a basis for day to day decisions and policy making.

Financial or general accounting provides information concerning the business enterprise which permits management to control in a general way the major functions of business: finance, administration, production, and distribution. During each period, business transactions are analyzed and recorded in books of original entry. At frequent intervals during the period, or at the end of the period, transactions which have been properly analyzed and summarized are posted to a general ledger and to subsidiary ledgers or records. At the end of the period, expense and income are closed into a summary account termed Profit and Loss which in turn is closed to Proprietorship or Surplus accounts. An analysis is then made in summary form to present changes in net worth that have taken place during the period; the items affecting the change in net worth are classified as expense and revenue. A second statement is prepared to exhibit assets, liabilities, and net worth or the financial status of the company at a particular moment.

In many cases, particularly in manufacturing concerns, it was felt that the details of operating efficiency of individual units was lacking in records obtained by general accounting. Day to

day cost information was deemed necessary for adequate control of efficiency, data for planning, a better basis for pricing of products, and a more satisfactory costing of inventory. To meet these deficiencies of general accounting, supplementary accounting methods have been devised known as cost accounting.

Cost accounting is a phase of general accounting procedure, for in the general books of account lie the accounts which control the cost accounts. Cost accounting provides a means of recording, presenting, and interpreting much more carefully the details of cost of materials, labor, and expense necessary to produce and distribute goods or render services. Cost accounting provides data for the determination of costs for each unit produced, service rendered, and each manufacturing and service department of an enterprise. Cost accounting is also a means of executive control in the form of a system of standard or estimate costs combined with budgetary control of expense.

The first object of cost accounting is to provide data for the control of the business enterprise. Accounting in itself cannot control variables but the use of accounting technique can determine the amount and the cause of the variance. Control is a managerial function.

Value of Accounting

Interest in accounting disclosures has widened to include an ever growing segment of society. The list now includes in particular: owners, managers, creditors, prospective investors, employees, and government officials.

Owners are particularly interested, not only in the results of operations in a certain period which net a return on their investment but also in the general financial condition of the enterprise as concerns the net assets representing the security of their original investment as well as the growth of that investment. Prospective investors are interested in past performances as indicated by accounting disclosures along with the trend of business activity in order to predict possible future conditions. The probable receipt of dividends and security of investment is of prime importance.

Labor has become increasingly interested in accounting disclosures. In the first place, laborers' jobs depend upon the success of the enterprise. An ever growing number of employees are acquiring stock in the company by which they are employed. Accounting affords information as a basis for union as well as individual wage demands and negotiations.

Creditors and prospective creditors are interested in the ability to pay. The security for loans and a basis for determining the amount and terms of payment can be arrived at by the use of accounting records.

In addition to keeping records of their own, the government makes extensive use of accounting records. The Bureau of Internal Revenue is interested for income tax purposes, and in the enforcement of the Social Security Act. The Federal Trade Commission is interested because the cost of manufacturing and cost of distribution are factors in determining compliance with the Robinson-Patman Act. The Labor Department must have evidence of compliance

with the Wages and Hours Law. More recently (and similarly in World War II), the Office of Price Stabilization in an attempt to regulate prices and rates has made a reliance on records mandatory.

Any approach to accounting theory should include a consideration of the needs of management. Every day, the executive uses information produced by his accounting department, whereas the owner, investor, or government official looks over the statements briefly a few times a year. General accounting supplemented by an adequate system of accumulating costs is becoming increasingly valuable to management in the following respects: 1. Coordination and control, such as, economic use and control of materials (waste, spoilage, and size of inventories), and efficiency of plant, machinery, and equipment. 2. Providing costs of manufacturing, selling, administration, of extending credit, carrying inventories, and providing evidence as to whether or not these costs are reasonable. 3. Analysis of financial trends. 4. A guide to pricing policy. 5. Determination of profitable and unprofitable lines of merchandise, territories, salesmen, and customers. 6. Effects of various volumes of sales upon the net profits. 7. Basis for dividends and sound financial policies.

Aspects Considered

This thesis was prepared with a view to providing managerial control. Obviously, each of the above points could involve a treatise in itself. Attention, therefore, was centered on particular problems characteristic of the milling industry with special emphasis on the cause and determination of variances between

actual and estimated costs.

PROCESS COST ACCOUNTING

Basic Records

The accounting procedure for a flour mill is basically the same as the accounting for any other industry engaged in manufacturing. The procedure is even simplified by the fact that the manufacture of flour and the resulting by-product is one continuous process, a continuous flow of the raw material, wheat, through a process of reduction and separation to extract flour of various grades, which results in several by-products such as bran, shorts and/or mill-run.

The books of account which record the various business transactions that occur from time to time under the general accounting procedure for an industrial enterprise are usually:

1. Voucher Register or Purchase Journal
2. Sales Journal
3. Cash Receipts Journal
4. Cash Disbursements Journal
5. General Journal
6. General Ledger
7. Customers Ledger
8. Creditors Ledger

Reference is made to the above books of account only in passing, and continued reference will be made only by way of their interrelationships to flour mill cost accounting.

It has been more and more generally accepted that some system of cost accounting is fundamental to an industry engaged in manufacturing. Especially is this true of the milling industry which has become more and more competitive in its operations. In this country, consumers have the protection afforded by the fact that the less efficient enterprises, when they suffer losses, must become more efficient or be eliminated. In order to meet competition, a successful miller must have adequate control at all times over his costs and particularly the variations between estimated and actual cost (the estimates necessitated by forward flour sales).

Choice of a Cost System

There are two general types of cost accounting systems: job order, and process cost.

Job order cost accounting is used when it is desirable to identify specific lots or batches as they are manufactured. The job order cost system can be used when products are manufactured in clearly distinguishable lots and when it is practical to keep a separate record of each lot from the time production is begun until it is completed.

Process cost accounting is used successfully in plants producing standard products which are intermingled in such a manner that lots are not distinguishable. Process cost accounting is predicated on the theory that average costs are typical of operating conditions of production and that average costs are of primary interest to management.

A mill produces standard products which are intermingled in

such a manner that lots are not distinguishable. In other words, when wheat is milled into flour, a continuous flow of wheat is processed and the bins are filled with various grades of flour and packed off in sacks or packages. It would not be economical or even desirable to attempt to compute a separate cost on every sack of flour as it progresses through the milling process. Cost per sack or per hundredweight is satisfactory for any particular run. The cost per unit (cwt.) is obtained by accumulating whatever costs are incurred, which must be absorbed by the product as a whole, and then spread evenly over the units making up the product. All mills do not produce a single product, which would simplify the accounting procedure, however; a single product will be processed for a scheduled time, followed by successive runs of other products. Each run is not entirely separate as to production and costs, but it is assumed that a satisfactory segregation of costs can be obtained.

Estimate Cost Accounting

Estimate cost is not a complete system in itself but is superimposed upon either a job order or process cost system. The purpose of such a plan is to predetermine what actual costs will be in order that management can use such information as a guide to, or a basis for, pricing and production cost control during the period.

The principle underlying an estimate cost system is to predetermine, at the beginning of the period, unit costs in terms of material, labor, and overhead by use of a cost card or cost

sheet. During the period the actual material, labor, and overhead costs are accumulated in summary accounts in the general ledger, and at the end of the period, the accounting records provide a means of comparing the estimates with the actual production costs.

It was anticipated that an estimate cost system, superimposed upon a process cost accounting procedure, would be usable as well as practical for the milling industry.

Standard Costs

Although a system of standards is not discussed, standard costs are equally applicable to flour milling. Standards are incorporated and operated in the same manner as estimates, the difference being in the way that the standard is determined. Estimate costs attempt to predetermine what actual costs will be. Standards, on the other hand, are an attempt to predetermine what costs should be if the plant is operated as a highly efficient unit.

Standards are predetermined costs based upon such factors as: Engineering specifications as to quantity and quality of material and labor; forecasts of market trends for price, with a fixed amount expressed in dollars for material, labor, and overhead for an estimated quantity of production.

Departmentalization

One of the most important steps in the operation of a process cost system is the proper classification of production activities into departments or processes. Accounting control involves the

analysis of operations into departments and the assignment of definite responsibility for the work of a department. Net results can be obtained by adding individual results, but individual results cannot be obtained from the total.

A department is a division or sphere of activity, a cost center which is limited to a single operation or type of work. The essential points to consider in departmentalizing a manufacturing concern are:

1. The convenience with which cost data can be assembled.
2. The preparation of an acceptable basis for a method of correct distribution of overhead.
3. The location and nature of operations with respect to physical movement.
4. The jurisdiction of supervision in order to fix responsibility, to enable accurate cost, and to enable production control.

The departments of a factory are usually classified into production departments and service departments. Production departments are those divisions of activity which add value directly to the product. Service departments are those which are not directly engaged in the manufacture of the product, but render services for the benefit of the production departments within the enterprise. The expenses of service departments are considered to be a part of factory overhead which must be allocated to the production departments and absorbed as a cost of production.

As a basis for discussion, milling operations are divided into the following departments:

Production Departments

1. Grain Department
2. Milling Department

3. Flour Packing Department
4. By-Products Packing Department

Service Departments

1. Traffic Department
2. Maintenance Department
3. General Office Department
4. Selling Department

Causes of Variance

Causes of variance between actual and estimate cost which are difficult to control are outlined as follows:

1. The ownership of grain

A. Quantity

a) Weight
b) Grade (protein, moisture, type, and condition)

B. Position

a) Quantity
b) Grade
c) Price

2. The production of flour and by-products

A. Yield

a) Temper gain
b) Screenings

B. Feed

a) Quantity
b) Type
c) Price

C. Clears

a) Quantity
b) Grade
c) Price

3. Miscellaneous causes

- A. Freight costs
- B. Package costs
- C. Ingredient costs
- D. Labor and overhead costs

Any one or any combination of the above variables can cause a discrepancy between actual results and estimate costs. Every time a flour contract is booked, an estimate must be made concerning the above list of variables. The success of the enterprise depends upon the reliability of, and the diligence with which, the estimate was made, as well as the operational efficiencies of the physical plant.

Estimate Cost Sheet

Cost sheets, or sales analysis sheets, were discussed in a section before; however, they were analyzed from the standpoint of common usage. The following is a proposed sales analysis.

The heart of an estimate cost system, used in conjunction with process cost accounting, is the cost sheet upon which the estimates are recorded. It is possible for an experienced and scrupulous salesman or executive to book flour sales by scratch pad calculations, but the accounting department needs more complete information for analytical purposes. A complete cost sheet must be made up for each booking in order to facilitate cost control.

The proposed cost sheet (sales analysis) is illustrated in Fig. 1. The content of the cost sheet is very similar to many used in firms today but particular differences are noted which require explanation.

The grain requirements are stated specifically for the grade

COST SHEET
Sales Analysis

Sold to _____	Date _____
Contract Number _____	
	Unit Cost Amount
Grain requirements:	
Grade	
1 Wheat	
2 Wheat	
3 Wheat	
Cost of 1 bushel grain mix	
Cost of _____ bushels grain mix	
Deduct feed at market:	
Bushels Grain Pounds of Feed	
Mixture at Standard Yield	
	Bran
	Shorts _____
Total	
Less safety factor	
Cost of grain in flour of all grades	
Deduct clears at market	
Bushels Grain Pounds of Clear	
Mixture at Standard Yield	
	1st Clear
	2nd Clear
	Low Grade _____
Total	
Less safety factor	
Cost of grain in 1 cwt. of _____ flour	
Cost of grain in _____ % of _____ flour	
Add cost of clear fed-in	
Total	
Margin for conversion and selling	
Selling price (before other costs)	
Add other costs:	
Containers	
Freight	
Trucking	
Enrichment	
Total selling price delivered	

Fig. 1. Estimate cost sheet.

of flour to be produced as compared to the use of differentials for flour grades. This one difference requires adjustments in anticipated feed production as well as in recovery of clear flour. In order to facilitate rapid calculation of grain requirements, feed recovery and clear recovery, a set of tables may be provided similar to those illustrated in Fig. 2.

The meaning of the different percentage flour grades will be helpful in understanding the tables in Fig. 2. The percentage merely indicates that the grade is obtained by taking off the best, 90 per cent, 80 per cent, etc., of the total flour stream. Thus, if it requires 2.35 bushels of grain to produce 100 pounds of 100 per cent flour it will require 2.61 bushels of grain in order to produce 100 pounds of 90 per cent flour ($2.35 \div .90$).

Feed production is directly related to the amount of grain used to produce a certain grade of flour. First it must be assumed that a certain amount of feed will be produced by each pound of grain ground. Assume that 2.35 bushels (141 pounds) of wheat ground will produce 100 pounds of flour and 41 pounds of feed. Then 60 per cent of that feed will be bran and 40 per cent shorts. In other words, 2.35 bushels of wheat will produce 100 pounds of flour, 24.6 pounds of bran ($41 \text{ pounds} \times .60$), and 16.4 pounds of shorts ($41 \text{ pounds} \times .40$). With the production of finer grades of flour, more wheat is required; consequently, a proportionately larger amount of feed will be produced.

Clear production is directly related to the grade of flour produced. If all of the flour streams are taken to make a 100 per cent grade, no clear flour will result. The shorter the

Grain Requirements Table

Flour Grade (Per cent)	Standard Yield	Grain Required (Bushels)
100	2.35	2.3500
90	"	2.6100
85	"	2.7647
80	"	2.9375
75	"	3.1333
70	"	3.3571

Feed Production Table

Flour Grade (Per cent)	Grain Required (Pounds)	Bran Production (Pounds)	Shorts Production (Pounds)
100	141.00	24.60	16.40
90	156.60	27.32	18.22
85	165.88	28.94	19.29
80	176.25	30.75	20.50
75	188.00	32.80	21.87
70	201.43	35.14	23.43

Clear Production Table

Flour Grade (Per cent)	Total Flour (Pounds)	1st Clear (Pounds)	2nd Clear (Pounds)	Low Grade (Pounds)
100	100			
90	111	5.5	2.75	2.75
85	118	9.0	4.50	4.50
80	125	12.5	6.25	6.25
75	133	16.5	8.25	8.25
70	143	21.5	10.75	10.75

Fig. 2. Cost card calculation tables.

patent (finer the grade) the more clear will be taken off. Assuming that the clear grades will be divided one-half first clear, one-fourth second clear, and one-fourth low grade (red dog), 100 pounds of the total flour will consist of the grade of flour desired, and the remainder will be clear flour, graded as indicated. In producing 85 per cent grade flour, 18 pounds of clear (118 pounds - 100 pounds) will result, divided as follows: 9 pounds first clear (18 pounds \div 2), 4.5 pounds second clear (18 pounds \div 4), and 4.5 pounds low grade (18 pounds \div 4).

In the cost sheet, the deduction of a safety factor in the case of feed and clear arises from the calculation of feed and clear at the current market price. Common practice seems to indicate that in computing the feed credit, market price less \$2 per ton, or 15 per cent of market price, whichever is greater, is used. In computing clear credit, no less than 10 per cent of market or 25 cents per hundredweight, whichever is greater, is used. It would seem that the credit taken should be tempered by market forecasts and trends. Careful consideration should be given to whether or not feed and clear sales are booked in advance. Forward bookings of clear flour are very common, and known recoveries should be shown at their true value.

The provision for adding the cost of clears fed in was made for the purpose of computing the price of blended flour or flour made of a combination of parts from primary grades. First, it must be determined which of the primary grades are to be used in making the blend. Then apply the percentage of the cost of the primary grades to be used. Assume that Grade G flour is to be

made by combining 80 per cent of Grade A flour and 20 per cent of Grade X- first clear flour:

Cost of grain in 1 cwt. of Grade A flour (from cost sheet)	\$4.60
Cost of grain in 80 per cent of Grade A flour ($\$4.60 \times .80$)	3.68
Add cost of clear fed in: 20 per cent of \$3.00 (market value)	<u>.60</u>
Total	<u><u>\$4.28</u></u>

Fig. 3. Computation of cost of flour blend.

The cost sheet, Fig. 1, is proposed for the following reasons, which are explained in greater detail in subsequent sections:

1. Basis for control of grain needs as to quantity and grade.
2. Basis for preparation and control of grain position (long and short report) as to quantity, grade, and price.
3. Basis for a position report on feed and clears (if desired).
4. Basis for obtaining information for comparison between estimate and actual costs and an analysis of the resultant variances.
5. Basis upon which interdepartmental contracts can be negotiated between the grain and milling departments.

It is essential that the cost sheet be prepared in triplicate, at least; one copy to the sales manager, one copy to the grain department, and the original to be attached to the firm's copy of the sales contract.

Explanatory notes are necessary at this stage concerning the necessity of preparing a differential cost analysis discussed

under the heading of "Price and Production Policy", and the cost sheet or sales analysis explained before. The incorporation of these estimates in accounting records is explained in detail in subsequent sections, but it is necessary to understand certain interrelationships of these estimates at this point.

The cost sheet shows estimates of cost other than the cost of conversion and selling. The cost of conversion is the labor and overhead costs of converting wheat to flour and by-products. These estimates are incorporated in the accounting records. The cost sheet also shows an estimate margin for conversion which is not incorporated in the accounts, but used merely as a means of comparison with the estimate costs of conversion shown in the differential cost analysis.

The differential cost analysis shows a detailed record of estimate costs of conversion. These costs are to be incorporated in the accounts.

GRAIN DEPARTMENT ACCOUNTING

Nature of Operations

Regardless of how involved the operations of a milling concern's grain department become, it is assumed that the primary purpose of such a department is to make available to the mill, sufficient quantities of the desired grades of wheat at a price approximating, as nearly as possible, the estimate price of wheat used in booking flour sales. Aside from this primary purpose, some grain departments do a regular cash grain trading business

and engage in extensive operations involving open and government storage.

It is becoming increasingly apparent that successful milling operations necessitate a grain department able to defray its own expenses as well as show a profit on its own operations. Proper evaluation of grain department efficiencies and the determination of contributions made to the success of the enterprise, require financial facts. The accounting records should be set up in such a manner that the grain department's profit or loss for each accounting period is completely segregated from the profit or loss on other operating divisions.

The grain department has been classified as a production department because it adds value directly to the product by proper mixing, conditioning, and storing grain. The purpose of the grain department might indicate that it should be classified as a service department. To a limited extent, producing departments may perform a service, and service departments may engage in production. The mill's grain department exemplifies a production department which performs a service to another production department.

For simplicity of illustration, it is assumed that the grain department's only purpose is to supply the milling department with its need for the basic raw material, wheat, to fulfill flour sales. The operations of the grain department then are as follows:

1. cash wheat purchases;
2. storage of milling wheat;
3. wheat conditioning;
4. hedging of wheat position;
5. issuing mixes to the milling department.

Basic control records were devised with these operations in mind.

Cash grain purchases can be made from various sources; in carload lots from outside suppliers, in truckload lots delivered direct to the elevator, or in carlots from the company's own line elevators. Carlot grain from outsiders may be purchased "on track" from samples brought to the cash trading floor of a board of trade, or "to arrive", that is, for future delivery within a specified period.

Causes of Variance

Variance between actual and estimate cost in the grain department is numerous. Accounting records must be devised to determine as accurately, as well as economically, as possible the amount and cause of the variance.

Physical quantity variance is caused by shrinkage (loss of weight) in the process of storage and conditioning in the grain elevator. Overall loss by shrinkage is not the only problem involving physical quantities. Proper grades must be purchased in sufficient quantities to provide the milling department with its grain requirements. Care must be exercised in the issuance of mill mixtures for the production of different grades of flour. Close contact must be maintained with the production manager to determine what grain is required by forward flour sales and whether or not he has been receiving proper mixes.

The grain department is responsible to the mill in pricing wheat to them at a per unit cost quoted when flour contracts were booked. This assures, insofar as possible, that the speculative element inherent in grain ownership is eliminated from the milling

department. The variance due to cash and future position is thus placed in the grain department. Cash wheat purchases, issuances to the mill for grinds, variations in yield, and new flour bookings will all affect the quantity and grade position. Careful scrutinization of these factors is of utmost importance to the grain department as well as the entire enterprise. Premiums and discounts of cash wheat over or under the futures will cause variances. A smart grain trader is a must to a successful mill.

Lastly, but not of least importance, is the variance between estimate labor and overhead costs, determined before the start of the accounting period, and actual costs accumulated during the period.

Wheat Control Account

The wheat control account together with supporting subsidiary records was designed to record and/or furnish a basis for the determination of the source and cause of variances due to the purchase, ownerships, and issuance of cash wheat.

Reference to the wheat control account, Fig. 1, will aid the reader in following the accounting procedure. Note that the debits and credits indicated are merely abbreviated summaries, but a detailed explanation is necessary to a full understanding of the account.

Grain department purchases of cash wheat are recorded in the books of original entry and posted in total periodically to the general ledger account, as follows:

<u>WHEAT CONTROL</u>		<u>WHEAT PRICE VARIANCE</u>
Actual quantity	Actual quantity	
@ actual price	@ "estimate" price	
Freight (E.C. to	(debit Wheat in	--Variance--
origin less K.C.	Process, milling	(from Wheat Control)
to mill)	department)	
	Inventory @ market	
	(theoretical cost)	
	Loss due to shrinkage	
	(charge Profit & Loss)	
--Variance--		
<u>TRADING ACCOUNT</u>		<u>WHEAT INVENTORY</u>
Gain	Loss	
		Inventory @ market (set up at end of period from Wheat Control)

Fig. 1. Selected grain department accounts.

Debit: Wheat Control

Credit: Cash (or a liability)

The amount of the debit is determined by multiplying the actual quantity (bushels) of grain purchased by the actual price contracted. The account does not accumulate futures dealings upon which it is not intended that delivery be made. The amount will, however, include wheat bought "to arrive" and "on track" as well as wheat actually in the elevator bins. Recognition of purchases "to arrive" and "on track" may require an adjusting entry at the end of the accounting period, if entries for purchases are not recorded until payment is rendered, or to be rendered.

Payments for purchases of wheat, other than truck grain, do not usually include freight charges to the mill. In other words, the price is stated f.o.b. shipping point (origin). Freight charges must, consequently, be paid to move the grain to the mill unloading dock. Transit billings were discussed earlier and only the accounting treatment need be mentioned here. Freight paid to the mill is recorded:

Debit: Wheat Control

Debit: Transit Control

Credit: Cash

The debit to Wheat Control is determined by the difference between the rate charged by the railroad to move the car to the mill and the through rate from origin to Kansas City (the terminal basing point for Kansas mills). Transit control is debited with the resultant excess paid the railroad, and cash is credited with the total amount disbursed. The theory behind this entry is

developed fully in the section "Transit Accounting".

The Wheat Control Account has now been charged with the cost of grain purchases, which includes the billed price plus freight based on the through rate from origin to the terminal basing point. Subsidiary records (not shown) supporting these entries are the perpetual inventory record (Bushel Control), unsettled pan tickets, the open contract file, and the file of transit tonnage paid and applied.

Sources of entries in the perpetual inventory record are obtained from car unloading reports, truck scale tickets, car loading out reports, and issuance-to-mill records. The Bushel Control, being a perpetual inventory control, need not carry detail as to quality of wheat in the elevators, nor on the quality or the individual ownership of wheat held for storage. The elevator superintendent should maintain a running bin card record on all mill bins, showing quantity and quality of contents. From the bin record, the superintendent prepares a summary bin report which gives the grain executive complete information regarding grain stock on hand. The total bushels shown on the summary bin report must coincide with the stock balance for the elevator shown on the bushel control.

The transit tonnage file is kept by the traffic department. The basis of entries in this record is transit tonnage paid in and tonnage applied to outbound shipments. Information relative to entries to be made to record freight on inbound shipments is supplied by the traffic officer. The balance of transit on hand at the end of a period, shown by the tonnage take off, will

constitute the tonnage applicable to the inventory of wheat on hand.

Issuance of Wheat to the Mill

Issuances of wheat to the milling department are summarized by an entry crediting the Wheat Control and charging the milling department Wheat in Process account. It was contemplated that the milling department profit and loss should contain, insofar as practical, no grain speculative element. To make this possible the wheat position of the milling department must always be kept perfectly balanced through daily purchases, from the grain department, of sufficient wheat of each mill mix to cover the day's net flour sales. This is accomplished through the negotiation of interdepartmental grain contracts. In effect, interdepartmental contracts call for delivery of wheat, on demand, to the milling department when needed for milling. The milling department does not own the wheat nor pay for it until it is ground into flour.

At the close of the market each day, the grain department furnishes the milling department with a list of prices covering each wheat mix authorized for sale. These prices are good until the opening of the futures market the next day. The grain department thus agrees to sell to the milling department, at quoted prices, whatever quantity of wheat is necessary to cover the flour sold during the period from one market session to the next. If sales are made during the market session, the sale must be made at special prices agreed upon, or included with sales made after the close of that day.

Interdepartmental contracts, and applications against those contracts, involve some basic questions to be answered: 1. What basis is to be used to determine the quantity of wheat that the grain department agrees to sell to the milling department? 2. What price will be charged for applications of wheat on the contracts negotiated? 3. How are variances between actual and estimated quantities to be handled?

The cost sheet, made up at the time flour contracts are booked, furnishes the basis upon which the estimated quantity of wheat requirements is determined. The cost sheet contains estimates, based on an estimate yield, of grain requirements by grade to produce each hundredweight of flour sold. A summary analysis must be prepared showing the grade requirements and the quantity needed (hundredweights of flour sold x each respective amount of grain required to produce one hundredweight) to fill the forward flour sales. The cost sheet also furnishes the price at which the quantities are to be delivered.

The quantities applied against the interdepartmental contracts are easily, in theory, determined by weighing of respective grades issued to the mill. The price to be used in determining the value charged against open interdepartmental contracts involves more complex problems. The milling department seldom knows exactly which flour contract it is grinding on when wheat is called for from the grain department. It may start operations by producing a certain grade of flour, grind for a specified time and change to another grade, and so on. The flour, thus produced, may be stored momentarily, loaded on freight cars awaiting shippin

directions, or loaded on trucks for delivery. The problem of matching each grain requisition with each specific flour contract is nearly impossible and definitely impractical.

The cost of wheat used may be determined in total at the end of each accounting period instead of by individual flour sales contracts. Daily grain requirements, evidenced by cost sheets, are entered on an interdepartmental grain contract sheet. At the end of the month the total values of the current month's interdepartmental contracts are added to the balance brought forward from the previous month; the current month's unfilled order balance is deducted at the contract price for each grade in unfilled bookings, unprotected by flour on hand; the result is the estimate charge for the current month's grind. Adjustments are then made for yield variations and the result is the actual charge for the current month's grind.

Further explanation for handling interdepartmental contract applications is necessary. Fig. 2 illustrates a suggested interdepartmental contract sheet. Procedure for entries follows:

1. Summarize each day's flour sales by grades, convert to bushel equivalents, and enter bushels of each grade required under the respective grade title opposite appropriate day of the month.
2. The firm grade prices quoted by the grain department at the close of the market each day are used to price all interdepartmental contracts, except special sales which may carry their own prices. The bushels required multiplied by the unit cost will give the amount to be entered under each grade of wheat. Addition of respective totals will determine the value to be entered

INTERDEPARTMENTAL GRAIN CONTRACTS SHEET

(Period covered)

Date of Contract	Contract Number	Cwts. Sold	Grade of Flour	Number 1 Wheat			Number 2 Wheat		
				Unit	Bushels	Cost	Unit	Bushels	Cost
.....	

Periods totals

Balance forward from last
period

Totals

Closing unfilled orders

Estimate charge for wheat used

Adjustments

Adjusted wheat used this period

Fig. 2. Interdepartmental contracts sheet.

in the column "Total Amount", which should be extended daily.

3. Period totals are determined by adding all columns as indicated. Bring forward all figures from the previous period's Interdepartmental Grain Contracts Sheet, labeled "Closing unfilled orders". These amounts will be entered on the current sheet opposite "Balance forward from last period". Addition of these amounts will give the entries in the "Total" line.

4. After entering the proper sums in the "Total" line, enter in the bushel columns in the "Closing unfilled orders" line the estimate amount of wheat of each respective grade needed to fill the unfilled bookings, unprotected by flour on hand, at the end of the period. Then derive the bushels in the "Estimate charge for wheat used" line by deducting the "Unfilled orders" bushels from the "Total" bushels. Enter the weighted average price for each wheat grade (refer to "Inventory Valuation") in the "Closing unfilled orders" line and extend each bushel figure by its respective price, entering the results in the "Total Amount" column. The "Total Amount" for the "Estimate charge for wheat used" is then derived by deducting the "Closing unfilled orders" amount from the amount in the "Total" line.

5. The "Total Amount" column will contain the value of the "Estimate charge for wheat used" (estimate quantity at estimate price) which is the basis for the entry charging the packing department for flour from the milling department. This is explained in a section concerning the two departments.

6. The explanation is complete if it were not for the fact that actual yield is not always exactly the same as the estimate

yield used on the cost sheet in determining flour prices. Yield variation causes variances in the quantity of wheat required by the milling department. Provisions are thus necessary for adjustments to flour contracts caused by yield. Adjustments may be made daily or only at periodical closing dates. Basic problems involved are the accuracy desired in the departmental charges and the grain position. The more frequently yield variations are recognized the more accurate the charges and the statement of long and short position. In any case, the adjustment is accomplished by providing an "Adjustments" line in the Interdepartmental grain contract sheet below the "Estimate charge for wheat used" line which will be the result of adding or deducting net variations from estimate yield. The "Adjusted wheat used" will then be the basis for the entry charging the milling department's Wheat in Process and crediting Wheat Control. A subsidiary record, summarizing daily yield variations, should be used in determining adjustments to be made.

A daily report will be made by the milling department to the wheat department informing them of the deviation from estimate yield. This yield should be on a dry dirty basis. This report will give the grain department the necessary information enabling them to adjust their long and short, keeping the wheat position balanced. If the yield reports are accurate, the grain department should know approximately the adjustment necessary at the end of the accounting period. Since they should have made adjustments in the long and short during the period, the actual position, after adjustments at the end of the period, should be nearly balanced.

The methods just described facilitate a more accurate presentation of the daily long and short report (a control for hedging operations) and the position statement (availability of, and grain requirements report). No basic change is recommended in either report but the information contained therein will come closer to presenting the facts. Grain requirements are available by grade, facilitated by the cost sheet analysis; wheat used is available by grades; and daily variation in yield can be considered in the reports. It must be recognized that the long and short report and the position statement are still approximate. In the production of unfilled contracts, a number of variables may enter into the production and shipment of flour that cannot be foreseen at the time the contract is made. In producing 80 per cent patent flour, for example, the percentage may vary from an 80 per cent to a 79 per cent, or an 80½ per cent or some other figure near an 80 per cent. Customers may change their specifications as to grade, paying a higher or lower differential to conform to the grade finally shipped. A customer, on the other hand, may contract for flour not knowing the quantity of each grade he might want delivered. Under these circumstances only estimates can be made of the grades to be shipped in computing the wheat position by grades. Position reports, of necessity, must be approximate, but the more accurate the information the more useful the report.

An alternate method of presenting the long and short report is illustrated below:

Wheat stock (owned)	XXX Bushels
Wheat Purchases (cash wheat)	XXX Bushels
Flour Inventory (by grade)	<u>XX</u> Bushels
Total	XXXX Bushels
(Less) Unfilled Contracts (requirements for specific flour grades)	<u>XXX</u> Bushels
Cash Wheat Long or (Short)	<u>XX</u> Bushels
(Less) Futures Sold or (Purchased)	<u>XX</u> Bushels
Net Long or (Short)	<u><u>Bushels</u></u>

Fig. 3. Alternate long and short report.

Wheat Account Closing Procedure

Shrinkage in wheat caused by physical handling and storage must be taken into consideration at periodical closing dates. The quantity of the shrinkage may be determined by using a fixed per cent of wheat stocks or by an actual weigh up of stocks on hand. When actual weigh ups are made, shrinkage may be represented by the difference between perpetual inventory stock records and the physical inventory weights. The value of the shrinkage should be computed at market (f.o.b. mill) and an entry made charging Loss Due to Shrinkage (closed to Grain Department Profit and Loss) and crediting Wheat Control.

The Wheat Control account has now been charged with the actual quantity of cash wheat purchased at the invoice price plus freight to the mill on a through proportional rate. Credits to the account have been made for issuances to the mill department on the basis of actual quantity at estimate (cost sheet) prices, and an

adjustment for normal shrinkage. One additional credit is necessary before a Wheat Price Variance can be determined. The inventory of wheat stocks must be set up at market (f.o.b. mill), adjusted by gains or losses in unfilled bookings and open futures. Inventory valuation is explained fully in a subsequent section. The point to note here is that the inventory is valued at a theoretical cost or an approximate representation of actual quantity at estimate prices.

The Wheat Control account balance will now represent a wheat price variance or the difference between actual prices paid for cash wheat and the estimate prices used when flour was booked. The price variance may be due to more than one cause, namely, efficiencies or inefficiencies in buying, handling and storing grain, and gains and/or losses from changes in the market price of cash wheat.

Wheat control is closed by either charging or crediting the account with the amount of the wheat price variance; the corresponding debit or credit, as the case may be, is made to the Wheat Price Variance account. If the Wheat Price Variance has a debit balance, it indicates, theoretically at least, that the actual price has exceeded the estimate; on the other hand, if the account shows a credit balance, it indicates that the actual price paid was less than the estimate. Wheat Price Variance is closed to Grain Department Profit and Loss.

Futures Operations

Since the milling department is to be relieved of speculative risk, the grain department bears the responsibility of protecting the company from speculative losses inherent in grain ownership. The fundamentals of hedging and keeping the position balanced have already been discussed, but an additional limitation of hedging and maintaining a balanced position is the "normal trading unit". Trades are normally made in "round lots" of 5,000 bushels and the smallest possible trade is the "job lot" consisting of 1,000 bushels; so the problem of keeping a "perfect" balance is practically impossible.

Accounting for futures operations involves only one general ledger account, Trading Account. This account is used to record only gains and losses on closed trades. Open futures accounts are maintained in subsidiary records only; but are considered in the determination of inventory values. The Trading Account account balance is ultimately closed to Grain Department Profit and Loss but a comparison should be made to the Wheat Price Variance. The profit or loss shown in the Trading Account should, theoretically, counterbalance a portion of the Wheat Price Variance since the profit or loss from closed trades should balance the profit or loss in cash wheat transactions. This will likely not be the exact case because the position cannot always be perfectly balanced. Other factors that must not be neglected have already been mentioned, that of efficiencies of grain handling operations within the grain department.

Accounting for Labor and Overhead

Accounting for labor and overhead in the grain department does not follow the general procedure of the estimate cost system used in conjunction with a process cost accounting system used in the milling and flour packing departments. The grain department as outlined is a separate productive unit operating as though it were an outside supplier of grain. The general principles of process cost accounting involve the accumulation of cost, both direct and indirect, in cost accounts during the period and are classified by departments at the end of the period. The grain department consists of only one department and performs but a single process. The grain operations could be further broken down by departments and processes, but the author does not believe it practical for purposes of this thesis. Process cost principles further dictate that in cases where products are processed in more than one department, costs of one department are transferred to the next department, the total cost of products being accumulated when completed. This does not apply to the grain department because issuances are made to the milling department at a predetermined price regardless of grain department costs.

It is not intended that the wrong impression be created concerning the accumulation of costs by process cost methods. Costs of labor and overhead will be accumulated in this manner and distributed to departments within the entire enterprise (to production and service departments) but these costs will not be further broken down within the grain department.

In view of the above difficulties, created by the fact that

a separate grain department profit and loss is determined, a simple financial accounting procedure will be used in accounting for labor and overhead in the grain department. Cost estimates will, nevertheless, be computed for grain department labor and overhead but these estimates will not be incorporated in the ledger accounts. The estimate costs are carried in the accounting records for comparative and statistical purposes only. It should be noted also that these cost estimates are not included in a differential conversion cost analysis.

Accounting for labor involves the use of a general ledger control account, Payroll, in which are accumulated the actual costs of labor, both direct and indirect, for the entire plant. The amount of the debit to Grain Department Labor, for the direct labor portion of the payroll, is obtained from subsidiary records containing daily time reports and salaries separated by departments. Amounts of direct labor are usually easily determined for the grain department because those who do work that can be directly identified with the product, wheat, are used exclusively in the grain department.

At the end of the period a summary entry is made crediting Payroll and debiting, among other accounts, Grain Department Labor for the department's actual share of the direct labor cost. Other debits will include: Other Departments' Labor, and Overhead (for the indirect labor portion of the payroll). Grain Department Labor is then closed to the Grain Department Profit and Loss.

Actual overhead is accumulated in general ledger control accounts during the period for the entire plant. At the end of

the period a summary entry is prepared debiting Grain Department Overhead (for allocated portion), other Departments' Overhead, and crediting Overhead for the total actual amount accumulated during the period. The Grain Department Overhead account is then closed to Grain Department Profit and Loss.

Other sources of income to the Grain Department may be derived from open and government storage grain. Accounts may be provided to accumulate such income.

Statement Presentation

The Grain Department Profit and Loss may be presented as illustrated in Fig. 4. Sales are evidenced, in the accounts, by issuances to the milling department (actual quantity, cost sheet price). The items under Cost of wheat sold concern cash wheat owned. Loss Due to Shrinkage must be added to the Ending Inventory; otherwise, the Gross cash wheat gain or loss, evidenced by the Wheat Price Variance, will not reflect the same amount indicated in the accounts; also, the Loss Due to Shrinkage could not be shown separately due to the fact that it would have been recognized in the total wheat cost. Net gain or loss on closed trades is shown in the account balance of the Trading Account. The remaining items are self-explanatory.

The Grain Department Profit and Loss presents an unusual appearance due to the fact that two general accounting techniques are used therein: estimate cost and financial accounting. No separate balance sheet is prepared for the grain department.

GRAIN DEPARTMENT

Statement of Profit and Loss
for Period Ended 19

Sales		XXXX
Cost of wheat sold:		
Beginning inventory		XXX
Purchases	XXX	
Add freight in	XX	XXX
Wheat available		XXXX
Less: ending inventory (theoretical cost)	XXX	XXXX
Add loss due to shrinkage	XX	XXX
Total wheat cost		XXXX
Gross cash wheat gain or (loss)		XXX
Net gain or (loss) on closed trades		(XX)
Net profit or loss on grain transactions		XX
Add: other income		
Open storage	XXX	
Government storage		XXX
Deduct: other expense		
Loss due to shrinkage	XX	
Labor	XX	
Overhead	XX	XXX
Net profit or (loss) for period		XXX

Fig. 4. Grain department profit and loss statement.

MILLING AND FLOUR PACKING DEPARTMENT ACCOUNTING

Nature of Operation

The general nature of operations of the milling department is concerned with the gradual reduction of wheat and the separation of flour and by-products. Wheat undergoes many different stages of completion and many different operations before the final product is obtained; however, to separate these processes and departmentalize the productive unit would seem impractical for general accounting purposes as well as from an economy standpoint. The more detailed cost analysis made possible by such a breakdown would, in general, be outweighed by the time and effort necessary to produce such results.

The process of packing the products of milling operations is distinctly different from the grinding and sifting, or milling, process. Packaging, therefore, has been separated from the milling department. The milling department costs will include only those of extracting flour and offal from wheat and the addition of such other materials, necessary to produce a certain grade of flour.

Finished flour and offal from the milling department are immediately issued to the flour packing department and the feed packing department; consequently, no inventory is assumed to be in the milling department at any time. Obviously, there is wheat continuously in the process of being milled but for accounting purposes this is eliminated by periodic "cut offs" before accounting statements are prepared. "Cut offs" are accomplished by

assuming that the mill is shut-down at a certain time. The wheat then in process is allowed to be completely processed and the products issued to the packing department which in turn packs the product for shipment. In smaller mills the mill may be actually shut-down for the periodic "cut off".

The flour packing department is responsible for the sacking or packing of various grades of flour and loading it for shipment. The operations are not complex and the only variances are those caused by lost, spoiled, or broken units, and the differences between actual and estimate costs of material, labor, and overhead.

Causes of Variance

Variance between actual and estimate cost occurs in the milling department as well as in other departments. These variances must be determined and analyzed.

Variance as to quantity will be the result of yield in the case of flour and offal. Yield will be affected by temper gains and the amount of screenings obtained in the cleaning process. Not only the amount of a particular grade flour obtained but also the quantity, type, and grade of feed and clear flour will be affected by yield. The cost sheet estimates anticipate the grain requirements for the production of a specific quantity of a particular grade flour. In making this flour, it is further anticipated that a certain total quantity of feed and clear will result. Further assumptions are made as to the separation by grade of feed and clears. Actual productive activity may produce amounts and grades differing from cost sheet estimates.

The cost sheet contains other estimates to be considered in the milling department. Ingredients costs for materials such as enrichment, malt, etc., to be added to certain flour orders, are estimated at the time flour is booked. Estimate costs and actual costs must be compared.

Labor and overhead estimates are the result, not of the cost sheet, but of procedures preparatory to differential cost analysis before the period begins. These estimates are incorporated in the accounting records and compared to actual costs accumulated during the period.

Most of the above variances are determined and presented in the milling department accounts but some variances, for various reasons, are determined and presented in other departmental accounts: namely, the flour and offal variances, which appear in the flour and feed packing department accounts, respectively. Accounting technique must be designed so that the proper variances appear in the proper accounts. The interrelationship of accounts, variances, and transactions between the milling and flour packing departments prompted the discussion of the two in the same section.

Accounting Procedure

An accounting plan is used which incorporates cost estimates in the general ledger accounts in connection with a system of process cost accounting. An average cost per unit of product is herein deemed suitable. Comparisons are made at the end of the accounting period when totals of estimate and actual cost for each element are brought together in work in process accounts.

The accounting procedure underlying the estimate and process cost technique is as follows:

1. At the beginning of the period the unit cost, per hundred-weight, of labor and overhead of the various products to be manufactured is estimated, as explained in the procedure preparatory to a differential cost analysis. During the period, the unit cost of wheat and materials is estimated by cost sheet analysis.
2. During the period, the cost estimates are used as a basis for costing goods transferred to the next process and goods completed and shipped. Wheat in Process, Materials in Process, Labor in Process, and Overhead in Process, milling department, are credited and the flour packing department Flour in Process account debited with the "Estimate cost of wheat used" (refer to pp. 58-65). The flour packing department's Materials in Process, Labor in Process, Overhead in Process, and Flour in Process accounts are credited and Finished Goods is debited for the estimate cost of products completed and shipped. The credit to Flour in Process includes the estimate cost of wheat, materials, labor, and overhead from the milling department only.
3. As goods are sold during the period, Cost of Goods Sold is debited and the Finished Goods account credited with the estimate cost of goods completed and shipped.
4. As flour contracts are filled during the period, Flour in Process is credited and Offal Control debited for the estimate credit allowed when the flour contracts were booked.
5. During the period the actual cost of materials, other than wheat, is recorded in the Materials account; the actual cost of

labor is charged to the Payroll account; and the actual indirect costs are accumulated in the Overhead account.

6. At the end of the period, the actual cost of direct materials, other than wheat, consumed in production is credited to the Materials account and debited to Materials in Process milling department, and Materials in Process, flour packing department. The actual cost of direct labor is credited to the Payroll account and debited to Labor in Process, milling department, Labor in Process, flour packing department and grain department Labor; and the actual amount of overhead, including indirect materials and indirect labor, is credited to the Overhead account and debited (on the basis of allocation schedules) to each Service Department, the grain department Overhead, Overhead in Process, milling department, and Overhead in Process, flour packing department. Service department costs are then allocated back to the production departments on the basis of equitable pre-determined rates, debiting grain department Overhead, Overhead in Process, milling department, and Overhead in Process, flour packing department. The corresponding credit is to each Service Department.

7. The "actual" wheat costs are determined in the grain department and at the end of the period Wheat Control is credited with the "Adjusted wheat used" and Wheat in Process is debited with the "actual" cost of wheat used during the period.

8. At the end of the period, as a part of the closing process, it is necessary to evaluate the inventory of flour on hand. By means of a "cut off", explained before, all goods are completely finished. In other words there is no goods in process inventory in

various stages of completion. Flour Inventory is debited and Flour in Process, Materials in Process, Labor in Process, and Overhead in Process, flour packing department, are credited for the estimate value of flour on hand. The credit to Flour in Process is determined by the estimate cost of wheat, after deducting the estimate offal credit (refer to Inventory Valuation, p. 127), other materials added in the milling department, and estimate milling department labor and overhead costs, indicated in estimates of cost of conversion. The amount of the credit to the flour packing department Labor in Process and Overhead in Process is also indicated in the estimates of cost of conversion. The amount of the credit to the flour packing department Materials in Process is determined by the weighted average estimate cost of materials contained in the flour inventory, indicated on cost sheets applicable to unfilled contracts.

9. At the end of the period, Flour in Process is credited and Offal Control debited for the estimate offal credit allowed on the basis of a weighted average price in all unfilled contracts. It is necessary that this entry be reversed before the next accounting period begins.

10. The balances remaining in the work in process accounts represents the variances between actual and estimate costs and the loss due to lost, spoiled, or defective units. The balances are transferred to Wheat Quantity Variance, Lost, Spoiled and Defective Work, and Material, Labor, and Overhead Variance accounts (in both the milling and the flour packing departments).

11. Cost estimates for subsequent periods must be revised,

if necessary, in accordance with errors localized in the variance accounts, due consideration being given to forecast changes in costs for the ensuing period.

Disposition of Variance

The disposition of variance is discussed separately from the above steps in accounting procedure, because the disposition is not as definite and clear cut as the rest of the process of accounting for costs. A general statement is ventured, however: Variances are disposed of by correcting the accounts for the amount of error in cost estimates so that cost records are corrected to actual cost.

The Wheat Quantity Variance is caused by differences in the estimate yield shown in the cost sheet used to book forward flour sales, and the actual yield, evidenced by the units of flour produced. The variance appears in the Wheat in Process account as a result of charging the account with the "actual" wheat cost and crediting the account with the estimate cost of wheat used.

Wheat Quantity Variance may be either a debit or a credit, depending upon whether the actual quantity exceeded, or was less than, the estimated quantity. A debit variance indicates that the actual quantity used was greater than the estimate. A credit variance indicates that the estimated quantity was greater than the actual quantity used. In either instance, the Wheat Quantity Variance will be disposed of in the same manner.

Estimate costs were used during the period, and at the end of the period, to determine the cost of goods sold and the ending

inventory of flour on hand. An estimate amount of wheat cost is therefore contained in the two accounts. In order to correct the accounts for the error, Cost of Goods Sold and Flour Inventory are debited, assuming a debit variance, or credited, assuming a credit variance, and Wheat Quantity Variance is credited, or debited. The amount of the debit or credit to Cost of Goods Sold and Flour Inventory, individually, will depend on the value of estimate wheat cost, used this period, now included in the two accounts. The basis for the allocation will then be the proportionate value of the total cost, now in each account.

Because of the fact that the great predominance of error will likely be in the Cost of Goods Sold account, it would seem most practical to close the variance only to Cost of Goods Sold.

Lost, Spoiled and Defective Work is caused by loss of units issued to the flour department for packaging and sale. Such losses may be the result of inefficiencies in the milling department, or even in the grain department due to improper issuances of grain mixes, long weights in flour packages, spilling of products, and package breakage in the flour packing department. Causes of loss should be analyzed and the variance disposed of accordingly.

Some of the loss may be due to normal conditions while the rest may be an abnormal loss. In general, normal losses should be allocated to the units completed, increasing the cost per unit; abnormal losses should be shown as such and disposed of to Grain Department Profit and Loss and/or Flour Production Profit and Loss, depending on where the inefficiency occurred.

Material Variance and Labor Variance accounts in the milling

p.19 omitted in page; test is complete

department and the flour packing department, are due to differences between estimate costs, determined by estimate quantity (or time), and actual costs determined by actual quantity (or time); and the differences between the estimate price (or wage) and actual price (or wage). The variances appear in the respective accounts as a result of charging the accounts with actual costs and crediting them with estimate costs.

Estimate costs were used during the period, and at the end of the period, to determine the cost of goods sold and the ending inventory of flour on hand. An estimate cost of material and labor is therefore contained in the two accounts. In order to correct the error, the same reasoning is followed for the disposition as explained before for the disposition of the Wheat Quantity Variance.

The total material and labor variances are due to two causes, namely: quantity and price, in the case of materials, and time and wage, in the case of labor. Additional analysis may be made showing separate causes of the total variance.

Material Quantity Variance is determined by the difference between the total estimate and actual quantity required to complete the period's production, multiplied by the estimate unit price of materials. Material Price Variance is determined by multiplying the difference between the estimate price and the actual price, by the total estimate material quantity to complete the period's production.

Labor Time Variance is determined by the difference between the total estimate and actual labor time to complete the period's production, multiplied by the estimate labor wage. Labor Wage

Variance is determined by the difference between the estimate wage and the actual wage multiplied by the total estimate labor time to complete the period's production.

The complications involved in the additional analysis of Material Variance and Labor Variance may indicate that the additional information is not worth the time involved in determining the additional variances.

The Overhead Variance, for the milling department and the flour packing department, is also caused by differences between actual and estimate costs, but estimate overhead is applied to production on the basis of a predetermined overhead distribution rate, a rate per unit to be applied on the basis of units completed. By first estimating the total overhead for a complete business cycle and then estimating the total production for the same period, the rate can be determined by dividing the estimated overhead by the estimated production. Several rates may be determined by assuming different levels of production and applying them accordingly as different levels of production are reached. Consequently, the Overhead Variance is the result of incorrect applications of rates and the variance should be disposed of as described for the disposition of the Wheat Quantity Variance.

Summary

By the methods described above, the actual and estimate costs have been determined, incorporated in the accounts and thereby brought together for comparison. Variances are shown and disposed of to correct the accounts to actual cost. The facts may thus

be presented to management in separate reports or incorporated in the formal statements.

ACCOUNTING FOR BY-PRODUCTS

Nature of By-Products

The distinction between joint products and by-products is difficult to define and authorities on cost accounting differ widely in their opinion. The differentiation is in reality only a matter of degree. Whether a product is considered a joint or by-product makes little difference except that it is generally agreed that costs of production before the point of "split off" should be allocated on some predetermined basis to the several products produced in the same process. On the other hand, by-products are considered to accumulate no costs, at least to the point of "split off".

A flour mill processes more than one commodity from one basic raw material. Flour is the commodity considered to be of the greatest importance to the firm and the resultant offal is disposed of by the most profitable means possible. Flour is sold on contract and a mill generally operates only if there are flour contracts on hand to be filled. In other words, a mill does not run to produce bran and shorts but operates to produce flour. In the process of doing so, bran and shorts are produced from the same process but are considered of less importance than the flour, though there is a growing and active market for mill by-products.

To obtain the cost of a sack of offal by allocating costs

of production to it from the time wheat enters the mill, would be extremely difficult as well as impractical. Flour millers have deducted an estimated return from offal in determining the price of flour for decades and the author sees no reason not to go along with them in their decision to treat offal as a by-product. Products of the milling process, other than the flour the miller is concerned with, will thus be considered and treated in the accounting procedure as by-products. It is worthy of note that the by-products are not to be considered as scrap. Scrap values often arise from incomplete or inefficient production; by-products arise from purposeful and efficient production.

Methods of Accounting for By-Products

There are many accounting methods which are considered usable in handling by-product values. The more important methods may be classified as follows:

1. Treat sales of by-products as other income. The main product bears all costs of production and its sale yields the operating income.
2. Treat sales of by-products as a reduction in the cost of producing the main product.
3. Treat sales of by-products as a reduction of production costs, after deducting manufacturing costs beyond the point of "split off" and all selling expenses incurred in their sale.
4. Treat sales of by-products as other income but deduct from that income the costs beyond the point of "split off".
5. Accumulate costs of by-products throughout the production

process and treat the net income from their sale as other income or operating income. To treat as operating income would in reality place the commodity in the joint product classification as far as accounting procedure is concerned.

These methods describe the general outline of procedure that may be followed. The actual and complete procedure for a particular firm or industry may necessitate special adaptations of the general procedure. Method 3 is considered to be most adaptable to flour mill accounting.

Importance of By-Product Control

The qualities of mill by-products for live-stock feeding purposes is well recognized. The salability of mill feeds is excellent and the price usually attractive. The market for by-products is particularly active in the mid-west and a flour mill located near this market has a definite advantage in disposing of its by-products. A miller may be primarily concerned with producing flour and he probably will not operate unless he has flour contracts and shipping orders; nevertheless, the successful manager knows that his success depends to a large extent on his ability to recognize at least as much from by-products as was allowed as a credit against the cost of producing flour. Flour milling is a highly competitive business; thus the margin of error must be small or a firm can no longer compete in the industry. By-products control then is important to successful operations.

Referring to the section on the Cost Sheet, it is noted that the price of flour is determined after deducting the bulk sales

price of anticipated offal. The bulk sales price of offal as of the date of the flour contract is used in determining that offal credit. The actual by-product will not be available for sale until the flour contract is ground on, which may be as long as 120 days, or longer, from the flour contract date. This means that the offal market may fluctuate considerably before the offal is actually available for sale and a safety factor must be used to provide for possible market declines.

Since the by-product credit must be determined well in advance of the realization of revenue, the situation gives rise to a probable variance between estimated realizable value, as used in the cost sheet, and revenue produced by the sale of the by-products resulting from the production of flour to fill the forward contract. This variance should be shown clearly in the accounts in order that management is informed of causes of profit or losses due to offal credit allowed on flour contracts. On the other hand, the Flour in Process account (charged with the estimate cost of wheat used) should be credited with the estimated returns from offal.

Marketing of By-Products

By-products may be sold as produced, stored for future sale, sold in advance by contract, and/or hedged in the futures market. Aside from this, a variety of commodities may be marketed from mill by-products; for example, the by-products streams can be run together and the "mill-run" spouted directly into freight cars or sacked before shipment; bran, shorts, and clears may be separated

and further graded; and mill-run can be further processed by special grinding before being sacked and loaded for shipment. Many mills have their own prepared feed plants which use the by-products of the mill as well as other ingredients to be added before the product is sold.

If mill-feeds are used in a prepared feed plant it is desirable to recognize a feed department separate from the mill proper. In such a case, the mill feed should be charged to the prepared feed department on the same basis as if it were sold to an outside interest; i.e., at the bulk mill-door market price at the date of issue. Costs in the feed department would then be accumulated and analyzed by process cost accounting records and may involve the incorporation of estimate costs as outlined for the milling and packing departments or the use of standard costs in a process cost system.

In the short run, the manner in which by-products are disposed of will depend first upon the facilities available to the mill. Recognizing this limitation, the demand for the various commodities will influence the way in which by-products are prepared for sale. The consumers' desires expressed in the market, influence the price offered for mill feeds. The price in turn more or less dictates the mill-feed combination to be offered for sale.

In view of the above facts, it is very unlikely that a mill will dispose of all mill feeds in the same manner. Some may be sold bulk, some sacked before shipment, some further processed by grinding and/or adding ingredients, and the combination of products may be varied. This situation makes it desirable to

accumulate further information about costs, profits, and losses beyond the point of "split-off".

Accounting Procedure

The accounting procedure for by-products is basically the same no matter how the by-products are marketed. A control account, Offal Control, is established to accumulate the estimate credit for offal expected to be produced. Offal control will be charged with amounts determined by the credit allowed on the flour contracts filled during the period, and the estimate offal credit in flour (by grade) on hand at the end of the period. The corresponding credits are to Flour in Process, reducing the cost of production of the main product, flour, by the amount estimated in the cost sheets. A further explanation of the entries is necessary because not only the price of offal but also the quantity expected to be produced was an estimate. The dollar amount will be determined then by multiplying the estimate quantity by the estimate price. The estimate quantity can be found by first determining the quantity of flour (by grade) shipped and on hand, and working back to the estimate offal that should have been produced as a result of producing specific grades of flour. The estimate price is indicated in applicable cost sheets (for flour shipped) and by the weighted average credit allowed in unfilled flour sales (for flour on hand). The entry for the estimate offal credit in flour on hand must be reversed before the start of the next accounting period.

The inventory of offal is determined by valuing the quantity

on hand at current market price. For inventory purposes, by-products may be valued at their sale price, or by making a suitable allowance from sale price to cover the cost of selling and handling. The offal credit in the cost sheet was determined by using the bulk price of mill feeds. To be consistent, the credits to offal control should be based also on the bulk price, even though the by-products are not subsequently marketed in that manner. The inventory of offal is set up by debiting Offal Inventory and crediting Offal Control, at market price of offal, less indicated safety factors, and adjusted by gain or loss on forward sales, if applicable.

The balance in the Offal Control now represents the estimate of offal credit applicable to offal sold. Offal Control is then closed by debiting Offal Profit and Loss and crediting Offal Control. Actual material, labor, overhead, and selling expense allocated from general ledger control accounts are also debited to Offal Profit and Loss.

Credits to Offal Profit and Loss are made at the time sales are made, or upon requisition from the commercial feed department. In either case the actual sales price is recorded. The entry is as follows: Debit Cash or a Receivable, and credit Offal Profit and Loss and Transit Control. The credit to Transit Control should be for freight charged to the customer when applicable.

The Offal Profit and Loss will now reflect a variance as evidenced by a debit or credit balance in the account. The offal variance will be caused by two factors, the quantity of offal obtained from the milling process, and the price at which offal was

sold after it was produced. The quantity will vary due to a difference between the estimate and actual yield in the milling process. The price may vary from the estimate due to fluctuations in the mill feed market and methods of marketing the products. The Offal Profit and Loss is closed by first setting up the Offal Variance account, then adjusting the Flour Inventory and cost of goods sold, which is ultimately closed to the general Profit and Loss account, by the amount of the variance. The adjustment is made on the basis of the proportionate value of flour finished this period, now in the respective accounts. The variance is shown in the Statement of Cost of Goods Manufactured as a deduction or addition to the Cost of Flour Manufactured, and in the Profit and Loss Statement as an addition to or deduction from Cost of Goods Sold.

TRANSIT ACCOUNTING

Tonnage Valuation

The nature of the in transit privilege was explained in a previous section. Due to this privilege, tonnage on hand at any particular time may have value. Inbound freight is paid for on the basis of a rate, origin to mill. As long as this tonnage is not cancelled, the payment can be applied against outbound shipments which carry a rate, origin to destination. Long hauls carry a lower rate than short hauls and the short haul payment can be used to reduce freight costs on outbound shipments.

The value of any piece of tonnage is determined by the

difference between the freight rate which will be charged by the railroad on an outbound shipment, tonnage applied, and the higher flat rate which would otherwise be assessed. In other words, the tonnage value is the difference in freight cost that would be charged from mill to destination on a flat rate and the balance that must be paid to move the shipment to destination using applicable tonnage on hand. The tonnage value then is merely the amount of prepayment which the mill has made against outbound freight charges.

Methods of Valuation

Tonnage may be valued by one of two principal methods depending upon the method of valuing wheat, flour, and mill-feeds for inventory purposes. Tonnage may be valued f.o.b. mill or basis terminal point.

Whichever basis is employed, it must be consistent not only with the valuation of inventories but also with the basis of valuing the issuance of wheat to the milling department, wheat and flour purchased, and unfilled contracts at the end of an accounting period.

Kansas mills use Kansas City as a basing point to which all values of grain products are related. This basing point is used because Kansas City lies in the line of flow from the wheat producing area to the flour consumption areas beyond.

Mills located at terminal basing points naturally use the terminal valuation method, and it may also be used by interior mills; however, most interior Kansas mills value their wheat and

wheat products basis f.o.b. mill.

Valuation Basis F. C. B. Mill

Since Kansas City is the terminal basing point for Kansas mills, the value of wheat and mill products will be less than the Kansas City value by the amount of freight charges necessary to move the commodities from the mill to Kansas City.

The cost of wheat purchases should include, not only the invoice price (K. C. Market less freight) but also the cost of moving the wheat to the mill. The first problem of transit accounting then is the determination of the cost of wheat purchases since the freight charges to the mill will normally be sufficient to later move the wheat or wheat products beyond the mill toward the Kansas City basing point. In order to determine the mill value of wheat purchased, two factors must be known: the freight rate from origin to Kansas City and from mill to Kansas City. Wheat purchases will then be valued by adding to the invoice price an amount determined by deducting the freight, mill to Kansas City, from the freight charge, origin to Kansas City.

Each individual piece of wheat tonnage is represented by a registered freight bill which will (1) indicate the name of the carrier, (2) the origin of the movement, (3) the origin date, (4) the routing, (5) the inbound freight rate, (6) the total charges assessed, and (7) the total pounds. The first four items determine the destinations to which the tonnage can be used on outbound movements and the particular freight tariffs which apply. The last item signifies the quantity of wheat and/or wheat products against

which the tonnage can be applied on outbound shipments.

It has been indicated previously, in "Grain Department Accounting", that wheat purchases are first recorded by reference to the invoice price. The second entry regarding that purchase involves the use of an account, Transit Control. Transit Control is a general ledger account in which all transactions concerning tonnage (or transit) are accumulated. As inbound freight bills are paid, Wheat Control and Transit Control are debited and Cash, or a liability, is credited. Wheat Control is debited with the freight charge necessary to move the shipment to the mill on a through rate (origin to K. C. less mill to K. C.). Transit Control is debited with the excess charge paid on the shipment, that is, total charge less debit to Wheat Control. The credit to Cash is for the full freight charge.

For illustrative purposes, assume that an interior Kansas mill buys its wheat primarily from elevators located "behind" the mill at country origin points in Kansas and adjacent states. The invoice price is determined by deducting from the Kansas City market price the freight rates from these points to the market basing point, Kansas City. The average origin cost of wheat purchases will thus be less than the value of wheat at the mill. Assume further that in a particular case the origin to Kansas City rate is 25 cents per cwt., the mill to Kansas City rate is 15 cents per cwt., and the origin to mill rate is 20 cents. The wheat price is quoted at \$2.52 per bushel, Kansas City. One thousand bushels of wheat is purchased and shipped to the mill. The following entry would be made to record the wheat purchase

and the payment of inbound freight:

Debit:	Wheat Control	\$2,430.00
Debit:	Transit Control	60.00
Credit:	Cash	\$2,490.00

It should be remembered that the freight rates are based on 100 pounds, while the wheat price is quoted per bushel (60 pounds); consequently, the rates per bushel are 15 cents, 9 cents, and 12 cents, respectively.

The amount of the debit to Wheat Control was determined by first deducting the freight rate mill to Kansas City, per bushel from the wheat price per bushel ($2.52 - .09$) and multiplying the remainder by the number of bushels purchased (1,000). This procedure values the wheat f.o.b. mill.

The credit to Cash was determined by first subtracting the freight, origin to Kansas City, per bushel from the wheat price per bushel ($2.52 - .15$) and multiplying the remainder by 1,000 bushels. The product is the payment to the seller. To this figure must be added the freight payment necessary to move the wheat to the mill ($.12 \times 1,000$ or $.20 \times 600$). The debit to Transit Control can now be determined by deducting the Wheat Control debit from the Cash credit or by a separate computation finding the excess paid in to the mill. In the second instance, the excess is the difference between the balance out charge, tonnage applied ($.15 - .12$), and the rate which would otherwise be assessed, or 9 cents, multiplied by 1,000 bushels. This same result can be obtained by multiplying 1,000 by the difference in freight cost that would be charged from mill to Kansas City (9 cents) on a flat rate, and the

balance that must be paid to move the shipment to Kansas City using applicable tonnage (3 cents).

Assuming no change in wheat price, the wheat purchased as illustrated would be valued, for inventory purposes, at the close of the accounting period, basis f.o.b. mill at the Kansas City basing point price of \$2.52, less freight from mill to Kansas City. The inventory value would thus be \$2,430.00, and the tonnage will be valued at the amount determined before (\$60.00). The total of the two assets, \$2,490.00, will match the amount of cash disbursed. If the sale of wheat were then consummated, the mill would realize \$2,520.00 at Kansas City, giving up the wheat and tonnage value worth \$2,490.00 f.o.b. mill and would in addition pay the balance of \$30.00 (.03 x 1,000) freight to Kansas City. The total assets relinquished would thus balance the income from the sale. If the sale were for delivery to a point between the mill and Kansas City, or a point beyond, the difference would be reflected in the selling price.

The preceding illustration has been submitted to illustrate the principles involved; however, calculations of this sort would require considerable clerical time if made on each separate wheat purchase. To eliminate a portion of this time, wheat purchases may be recorded at invoice cost during the period. As inbound freight bills are paid they may be charged to a suspense account to be closed out at the end of the period charging Wheat Control and Transit Control respectively on the basis of subsidiary records kept in the traffic department.

Transit Control is the general ledger account in which all

transactions concerning tonnage are accumulated; therefore, balance charges paid out to destination are also charged to Transit Control. The account is then charged with the freight from origin to destination, less the proportionate rate from origin to mill which should be recovered by using the f.o.b. mill price of wheat when flour prices are determined. The rest of the freight, excluding freight tax, should be recovered by freight charged, mill to destination, to the customer.

Transit Control is credited with freight charged to customers, indicated on applicable cost sheets or by using tariff rate schedules. This credit is made at the time flour, clear, or feed sales are recorded. Two additional credits, accounting for transit cancellations and the transit balance must be considered.

Transit cancellations may occur if the wheat, flour, and feed stocks are not sufficient to balance the tonnage on hand. At the end of any particular period, transit cancellations may be anticipated if tonnage on hand exceeds wheat, flour, and mill-feed stocks. Mill products may be trucked to destination and if sufficient amounts of flat wheat are not purchased to cover the trucked mill products, transit cancellations will result. If such a situation occurs and cancellations have not actually been made, the least advantageous tonnage should be theoretically cancelled by charging Grain Department Profit and Loss and/or Cost of Goods Sold and crediting Transit Control for the value of the transit cancelled. The cause of cancellations must be determined before the proper charge can be made. Cancellations which are the result of negligence on the part of the grain department in buying available

trucked wheat, or flat wheat, that could be made available, should be charged to the grain department. On the other hand, the value of cancellations resulting from trucked products beyond reasonable coverage by the grain department, should be charged to Cost of Good Sold. Entries recognizing theoretical cancellations, regardless of cause, should be reversed before the next accounting period. Actual cancellations are recorded in the same manner but no reversing entry is necessary.

End of period closing procedure requires that the asset account Prepaid Transit be recognized. Prepaid Transit is set up by debiting that account and crediting Transit Control for the tonnage balance on hand, having considered cancellations. This tonnage balance should be determined by a take-off of the transit slips or traffic department subsidiary tonnage records. The take-off is accomplished by listing each piece of tonnage on hand by weight and respective freight rate from origin to Kansas City, and the total freight from origin to Kansas City can thus be determined as shown in the recapitulation, Fig. 1. The difference between this figure and the total freight paid, less freight tax, on the same tonnage from origin to mill will determine the tonnage balance. A simple form for a tonnage take-off is shown in Fig. 1.

As indicated in Fig. 1, two similar work sheets must be made up: one to determine the "Total Freight from origin to Kansas City", and the other to determine the "Total Freight from mill to Kansas City". The difference between the two amounts, of course, is the tonnage balance.

Transit Control has now been charged with the excess paid in

Tonnage Take-Off

Origin	(Rate per cwt., origin to Kansas City or mill to Kansas City)								
	15¢	15½¢	16¢	16½¢	17¢	17½¢	18¢	18½¢	19¢

Origins of particular shipments listed in this column Total pounds from particular origins listed in these columns under appropriate headings.

Total Pounds

Recapitulation

Freight Rate (as above)	Total Pounds (as above)	Amount (Freight Rate x Total Pounds)
15¢		
15½¢		
16¢		
16½¢		
17¢		
17½¢		
18¢		
18½¢		
19¢		
Total Freight (origin to Kansas City or Mill to K.C.)		=====

Fig. 1. Determinations of tonnage balance.

to the mill plus the amount paid out to destination. It has been credited with amounts charged to customers, tonnage cancellations, and the transit balance. At this point, Transit Control may have a debit or credit balance which is closed to Transit Gain or Loss.

Due to the complicated freight rate system, seemingly illogical at times, certain transit may be applied more advantageously on some outbound shipments than others. This situation gives rise to possible gains or losses from transit applications. Advantageous tonnage is often used as a means of getting business rather than a source of apparent profit. Regardless of the way tonnage is applied or used, a gain or loss should be recognized as indicated.

Transit Gain or Loss may be shown in the Profit and Loss Statement, as a determinant of Grain Department Profit or Loss, or as an addition or deduction in determining the income from product sales. Expediency may indicate that transit gain or loss should be shown as other expense, or other income. Theoretically, the cause should be determined and shown accordingly. The grain department should be charged or credited with transit losses or gains directly traceable to grain purchases from points carrying advantageous, or disadvantageous, tonnage. Income from product sales should be increased or decreased by amounts caused by allowing price differentials on the basis of transit or shipments made to advantageous, or disadvantageous, destinations.

Freight tax has been mentioned only incidentally above. A tax of 3 per cent is assessed on each freight bill and should be recorded when paid by a debit to Freight Tax and a credit to Cash. Such expense may be considered as an item of other expense, but actually such charges increase the cost of goods sold.

Valuation Basis Terminal

The terminal method of valuing tonnage is discussed here only because some mills value wheat, flour, and mill feeds on this basis. It should be remembered that all illustrations in this thesis have been calculated on the assumption that the f.o.b. mill valuation is used.

The terminal valuation method is naturally used by all mills located at terminal basing points; actually in those cases the method does not differ from the f.o.b. mill basis because the mill and the terminal basing point are one and the same. In the case of mills located at the basing point, no Transit Control account is usually necessary. All freight payments on inbound wheat are charged directly to Wheat Control so that this account absorbs all charges incurred in putting the grain into terminal position. If mills at this location do buy wheat which carries inbound freight payments entitling the mill to move wheat or wheat products to destinations beyond the terminal point without additional freight payments, this tonnage value will be set up in the Transit Control account and handled in the usual manner.

Interior mills, behind the basing point, using the terminal method have the problem that most of the tonnage acquired on inbound wheat will require additional payments to move the grain to the terminal basing point. As wheat purchases, including flat stocks, are received, and inbound freight paid, the balance out freight, necessary to move outbound shipments to the terminal point, is set up as an additional debit to Wheat Control, the corresponding credit is to Transit Liability. The complete entry to

record the payment for wheat and freight on inbound shipments is as follows:

Debit: Wheat Control (K. C. market price)

Credit: Transit Liability (balance freight to K.C.)

Credit: Cash (invoice price plus freight to mill)

If tonnage is used outbound on wheat shipments the Transit Liability account is debited at the time of shipment with the amount originally set up applicable to the particular tonnage applied, with a credit to Transit Adjustment, Wheat. Outbound freight payments, if any, are charged to Transit Adjustment, Wheat. If tonnage is used on wheat product shipments, the Transit Liability account is debited, at the time of shipment, with the amount originally set up applicable to the particular tonnage applied, and a credit is made to Transit Adjustment, Flour, or Transit Adjustment, Offal. If wheat products are trucked, the Transit Liability is debited and the Transit Adjustment, Flour, or Offal, credited with an amount determined by the freight from mill to Kansas City. The outbound freight payments will be charged to Transit Adjustment Flour, or Offal.

In using this method, wheat and products sales are recorded gross, including freight charged to customers, instead of net, as explained in the f.o.b. mill method. At the end of the period the balances in the respective Transit Adjustment accounts are closed to Grain Department Profit and Loss and Cost of Goods Sold respectively. Thus, no transit gain or loss is indicated, but the net effect is the same because the transit gain or loss will be considered in the determination of profits.

At the end of the month, the balance in the Transit Liability account will be verified by a take-off of tonnage on hand. This take-off will list each price of tonnage and show the balance freight to the terminal point on each. The total balance freight on the entire list of tonnage plus freight on flat stocks, if any, should correspond to the balance in the Transit Liability account. The amount of freight on flat stocks is determined by comparing total pounds of tonnage on hand with the total pounds of wheat and wheat products on hand. Excess pounds times the mill to Kansas City rate will determine the additional freight. If any piece of tonnage on hand at the end of the period has had sufficient freight paid in on it to carry an outbound freight shipment beyond the terminal point, this excess should be entered on the take-off in red and be considered as a deduction in totaling the balance freight on the take-off.

If, at the end of the period, tonnage on hand is greater than the stocks at the mill, enough of the poorest tonnage should be theoretically cancelled to bring the tonnage and stocks into balance. The value of that tonnage should be credited to Transit Liability, increasing the balance out cost by the value lost, and charged to Cost of Goods Sold and/or Grain Department Profit and Loss, depending on the cause. This entry will be reversed before the start of the next accounting period. Actual cancellations are recorded in the same manner, but no reversing entry is made.

Tonnage on Storage Grain

Provisions must be made to segregate transit on storage grain. This is accomplished by earmarking and actually segregating the specific freight bill from the mill's own transit or considering it as the mill's own transit, and making appropriate adjustments at the end of the period.

The earmark method requires that transit on storage grain be charged to an asset account, Transit on Storage Grain, at the time of payment on inbound shipments. The freight bill is then clearly marked as storage transit and eliminated from any subsequent transit take-off. If the customer reimburses the mill, debit Cash and credit Transit on Storage Grain. If the grain is then bought in, the customer will be paid the Kansas City price less the balance freight to Kansas City and the transit is taken into the accounts in the usual manner. The same procedure is followed no matter which method of transit valuation is being employed, f.o.b. Mill or Basis Terminal.

If tonnage on storage grain is used as if it were the mill's own transit, the accounting entries are made in the same manner. Since each particular piece of tonnage is not earmarked, a subsidiary record is necessary in which storage tonnage is recorded. On the basis of such a record, appropriate tonnage is eliminated from the transit take-off at the end of the period.

Inbound freight on storage grain may be recorded in the accounts as though paid for the mill's own account. Such a procedure would require an adjusting entry at the end of the period so that the entire freight paid in will show as an asset on the balance sheet, if the mill has not been reimbursed by storage cus-

tomers prior to that date.

In such a case, the f.o.b. mill valuation basis would require the following entry for unsettled storage transit at the end of the period:

Debit: Transit on Storage Grain (freight, and tax, origin to the mill)

Credit: Freight Tax (paid on storage freight)

Credit: Wheat Control (origin to K.C. less mill to K.C.)

Credit: Transit Control (excess paid in to mill)

If the Terminal Point valuation basis is employed, the adjusting entry for unsettled storage transit at the end of the period would be as follows:

Debit: Transit on Storage Grain (freight, and tax, origin to mill)

Debit: Transit Liability (balance freight to Kansas City)

Credit: Freight Tax (paid on storage freight)

Credit: Wheat Control (freight from origin to Kansas City)

The adjusting entry in either method must be reversed before the beginning of the next accounting period.

INVENTORY VALUATION

Nature of Inventories

An inventory is an itemized list of goods and their respective value. "Inventory", as applied here, includes all types of materials, supplies, and finished goods. More specifically, materials are goods purchased by the manufacturer on which productive functions

)

must be undertaken prior to their disposition in the form of finished product. Finished goods include those on which all manufacturing operations have been completed and are being held for sale. Supplies are actually materials, but materials which facilitate operations, rather than physically embodied in the product.

Flour Mill inventories will comprehend the value of wheat and other material, such as sacks and ingredients; flour and offal; stationery, stamps, repair parts, and other office and production supplies. The inventory is the amount remaining as a result of purchasing, storing, and issuing materials; using and adding value to materials by the application of labor and overhead; finishing and selling products; and purchasing and using supplies.

Theory of Valuation

Many methods of inventory valuation have been advanced and many variations are considered acceptable under special circumstances, while other bases and variations are widely applicable. The principal pricing bases may be listed as follows: 1. cost; 2. reproduction cost; 3. cost or market, whichever is lower; and 4. selling price.

The cost approach to inventory valuation seems to be the most reasonable and satisfactory in general, and particularly so in connection with milling. Certain specific variations are necessary but the principal basis is cost. The selling price principle is applicable only in the case of by-products ready for sale.

The cost basis may be defended by the following arguments. Inventory is composed of goods, the cost of which is applicable

to future revenues and as such should be excluded from current charges to sales. The use of a basis other than cost results in the recognition of unrealized gains or losses. The very essence of sound accounting is consistency and a consistent policy in cost accounting requires that inventory be valued at cost, particularly if estimate costs are incorporated in the accounts. Assets, including inventories, are worth what they cost until proved otherwise through sale, due consideration being given to physical depreciation and obsolescence. Cost is particularly adaptable to mill inventories as evidenced by a quotation from W. A. Paton:

The position may well be taken that in the case of standard goods flowing through the enterprise in terms of ordinary operating activity the use of the cost basis of inventory valuation is the preferred policy. With this policy in effect the difficult tasks of estimating and recording unrealized losses is entirely avoided (as far as regular inventory is concerned), and periodic income is measured in terms of a process of matching sales with costs actually incurred in connection with the manufacture of the product sold.¹

The "cost or market" rule has been widely used and defended by many accountants. Serious objections to its application, however, may be offered. First of all it is inconsistent, market declines are recognized as having an effect on the financial condition and progress of a business while market rises are ignored as having any effect. "Cost or market" makes it necessary to compute two values on each item of inventory, a cumbersome and costly process, particularly in a manufacturing concern. Last of all, profits may be shifted, as between accounting periods, if

¹W. A. Paton, Advanced Accounting (New York: The Macmillan Company), 1941, p. 158.

strict adherence to cost or market is maintained. This situation will occur if replacement cost is below original cost, but still above the value assigned to the inventory last period, assuming the inventory is held through more than one period.

A further point in favor of cost as a basis for flour mill inventories, of wheat and flour, is that, theoretically, the inventories are protected from fluctuations in market price.

In the case of purchased materials and supplies actual cost means the net invoice price plus transportation and other costs incurred in acquiring the goods. Finished product cost of goods on hand should include all material, labor, and properly allocated portions of overhead used in the process of manufacture. The valuation of inventories actually requires specific identification if actual cost is to be determined.

Specific identification is difficult, if not impossible, in many cases; consequently, many theoretical methods of determining cost have been developed. Some of the methods most commonly used are: 1. the first goods in are the first goods out (fifo); 2. the last goods in are the first goods out (lifo); 3. the weighted average cost method; 4. the moving average cost method; 5. the gross profit method; and 6. the retail method. The last two methods are used extensively in retail establishments, but are not easily adaptable to manufacturing concerns.

The basic assumptions and procedures of the above methods are ably set forth in any good accounting text; therefore, they are not discussed in detail here.

Practical Applications

The author assumes that it is not possible or at least practical to maintain specific identity of individual items in inventory. This is indeed true in the case of wheat and flour stocks, discussed at length later in this section.

Materials, other than wheat, and supplies should be valued at cost. Cost may be determined by one of several methods but the assumption that the first materials and supplies in are the first to be issued, or used, is as logical an assumption as any. In other words, the inventory at a periodic closing date represents the most recent purchases. Obviously, stock records must be kept which will indicate the receipts and issuances of materials and supplies so that the prices of the most recent purchases can be determined.

Offal, to include bran, shorts, and clear flour, should be valued at market for inventory purposes. Offal is a by-product of flour production and by-products may be valued at market price. No costs of production are allocated to the by-products and in "Accounting for By-Products" it was explained how the sale of offal was considered to be a reduction in the cost of producing the main product. The method described is based further on the assumption that the market price of by-products is a measure of their cost. Not too logical an assumption, perhaps, but usable.

Mill-feeds are readily marketable, an additional defense of the selling price basis. Because of the ready market for mill-feeds, many sales may be made on forward contract. Such a practice would indicate that an adjustment be made in the inventory

valued at market. The adjustment is to be determined by the gain or loss in unfilled sales. In other words, value the inventory at the price at which the by-products have been sold plus what can be realized when the remainder is sold. It is further recommended that adjustments be made for possible market declines (by use of a "safety factor") and to provide for handling and selling costs.

Reference should be made to "Accounting for By-Products" if further clarification is needed on the above discussion of valuing by-products on hand.

Wheat and flour inventories are theoretically protected against market fluctuations. This is accomplished by the practice of hedging and selling flour on forward contract. The wheat and flour inventory should be valued at cost; however, the method of cost determination differs from the methods generally in use in other industries.

Wheat has a quality which makes possible the interchangeability of quantities. It possesses the quality of mutual substitution. Purchases of grain by milling companies are not made on the basis of a fixed price, and inasmuch as grain is stored in large quantities, the segregation in the elevator as to each purchase is impossible. It is also impossible to maintain the specific identity of each type, variety and grade. The wheat on hand at any time is usually a mixture of wheat acquired at many different times and from many different places. It would be practically impossible to determine the actual cost of the stock of wheat on hand, since the original source of the wheat and the time of purchase can

rarely be determined.

In view of these difficulties there has developed what is referred to as a theoretical cost basis of valuing flour mill inventories. Common practice in the industry indicates that both wheat and flour inventories are valued at an adjusted market value. The author values only wheat at an adjusted market value and flour in another manner, explained later in this section. The two methods produce the same end result but accomplish different objectives before the net result is obtained.

Wheat is valued at the current Kansas City market price adjusted by the gain or loss in open futures trades and unfilled flour contracts (unprotected by flour inventories). Any gain or loss which may result from pricing the inventory at market will be offset by a like amount of gain or loss on unfilled orders and futures trades. The inventory will in effect be reduced to cost or approximate cost.

The application of this method is predicated upon the consistent maintenance of a policy of hedging. The first step in valuing the inventory, therefore, is to ascertain the company's grain position as of the inventory date. This involves a careful analysis by the use of a long or short by grade (refer to "Grain Department Accounting"). The position at the inventory date will not assure a consistent policy of hedging but for purposes of the first illustrations, a consistent policy is assumed.

As a basis for illustration, assume that a company received an order for the sale of 1,800 cwts. of flour, for the manufacture of which it requires 4,230 bushels of wheat, quoted at \$2.00 per

bushel on the day of the flour sale. Immediately upon receipt of the order, the company purchased 8,460 bushels of cash wheat at \$2.00 per bushel and, the quantity of grain bought being 4,230 in excess of the requirements, sold on the same day in the futures market 4,230 bushels of wheat at \$2.05 per bushel. Before any quantity of the flour was manufactured, the company took an inventory, at which time cash wheat was quoted at \$1.90 per bushel and futures at \$1.95 per bushel. On the basis of the foregoing assumptions the inventory would be valued as follows:

	Price	Amount
8,460 bushels of wheat priced at market	\$1.90	\$16,074.00
Add:		
Profit on open futures trades:		
4,230 bushels of wheat		
Price at which futures sale was contracted	2.05	\$8,671.50
Price at which wheat may be purchased in the futures mar- ket to meet contract	1.95	8,248.50
Profit on unfilled sales orders		423.00
1,800 cwts. flour requiring 4,230 bushels of wheat. At price to be recovered from customer in sale of flour	2.00	8,460.00
At market price of grain in inventory	1.90	<u>8,037.00</u>
Inventory value for purposes of closing		<u>\$16,920.00</u>
Equivalent to original cost of 8,460 bushels at \$2.00 per bushel		

Fig. 1. Wheat inventory valuation.

In the foregoing illustration it is assumed that the selling price of the flour was based on the wheat at cost and the market price of wheat had declined. If the converse condition had existed,

i.e., if the market price of wheat had advanced, the book profit representing the difference between the cost and market value of the wheat on hand would have been offset by a loss on open futures and unfilled sales orders (assuming that the cash and futures markets had moved in the same direction and by the same margin), and computed on this basis, the result would be the same as that determined above.

Thus, where the inventory is hedged and fluctuations in market prices have affected the cash and futures markets in the same degree, the application of the method indicated above should result in an inventory valuation at cost. Such valuation, however, does not necessarily represent the cost of the grain on the date of purchase, as was the case in the illustration, but may be in excess of or below that figure. Assume, for example, that in the preceding illustration the milling company sold prior to the inventory date (when cash wheat was \$1.90 per bushel) another 1,800 cwt. of flour when the market price of cash wheat was \$1.95 per bushel and futures were quoted at \$2.00 per bushel and that immediately upon making this sale the company had closed its futures trade by a purchase in the futures market of wheat at \$2.00 per bushel. All other factors remaining the same, the inventory would be stated at \$16,708.50, or \$11.50 below original cost, computed as follows:

	Price	Amount
8,460 bushels of wheat priced at market	\$1.90	\$16,074.00
Add: Profit on unfilled orders:		
First sale:		
1,800 cwts. of flour (4,230 bushels)		
At price to be recovered from customer in sale of flour	2.00	\$8,460.00
At market price of grain in inventory	1.90	<u>8,037.00</u>
		423.00
Second sale:		
1,800 cwts. of flour (4,230 bushels)		
At price to be recovered from customer in sale of flour	1.95	\$8,248.50
At market price of grain in inventory	1.90	<u>8,037.00</u>
		211.50
Inventory value		<u>\$16,708.50</u>

Fig. 2. Wheat inventory valuation

If instead, cash wheat and futures had been quoted at \$2.02 and \$2.07 per bushel, respectively, when the second sale of 1,800 cwts. of flour was made, the value of the grain inventory would have been \$17,004.60, or \$84.60 in excess of original cost, shown as follows:

	Price	Amount
8,460 bushels of wheat priced at market	\$1.90	\$16,074.00
Add: Profit on unfilled orders:		
First sale:		
1,800 cwts. of flour (4,230 bushels)		
At price to be recovered from customer in sale of flour	2.00	\$8,460.00
At market price of grain in inventory	1.90	<u>8,037.00</u>
		423.00
Second sale:		
1,800 cwts. of flour (4,230 bushels)		
At price to be recovered from customer in sale of flour	2.02	\$8,544.60
At market price of grain in inventory	1.90	<u>8,037.00</u>
		507.60
Inventory value		<u>\$17,004.60</u>

Fig. 3. Wheat inventory valuation.

Under varying conditions, the same grain inventory valuation may be computed at \$16,920.00, \$16,708.50 or \$17,004.60 without departing from the cost basis. In the first illustration, the futures trades remained open on the date of the inventory and no settlement had been made, involving the collection or payment of cash. In the other illustrations, however, the company closed its futures trade upon the second sale of 1,800 cwts. of flour, and collected \$211.50 in one case and paid \$84.60 in the other, representing its gain and loss respectively on the futures transactions:

	Per bushel	Amount	Per bushel	Amount
Profit or loss on futures trades:				
4,230 bushels of wheat sold (in con- nection with the purchase of cash wheat)	\$2.05	\$8,671.50	\$2.05	\$8,671.50
Purchased (upon second sale of 1,800 cwts. of flour)	2.00	<u>8,460.00</u>	2.07	<u>8,756.10</u>
		\$ 211.50		\$ 84.60*

*Loss

Fig. 4. Gain or loss on closed futures.

Further evidence that the cost basis has not been departed from in the above illustrations, may be explained by noting the effect in the grain department's ledger accounts. In the first example the Wheat Control account would contain a debit of \$16,920.00, the original cost of grain, and a credit for the same amount when the grain is issued to the milling department for fulfillment of the flour contract. In the second illustration the Wheat Control account would contain a debit of \$16,920.00 but by valuing the inventory at \$16,708.50 a debit variance of \$211.50 will arise which is closed to Wheat Price Variance account in the closing process. However, the Trading Account will show a credit balance of \$211.50 due to a profit from closed trades. Thus, the Wheat Price Variance is exactly offset by the profit in the Trading Account, no gains or losses will be evidenced. The inventory value of \$16,708.50 will be recovered by the grain department when wheat is issued to the milling department, and subsequently

from the customer in the price of flour.

In the third illustration, the Wheat Control account would contain a debit of \$16,920.00 (the original cost of grain) but by valuing the inventory at \$17,004.60 a credit variance of \$84.60 will arise which is closed to Wheat Price Variance account in the closing process. However, the Trading Account will show a debit balance of \$84.60 due to a loss from closed trades. Thus, the Wheat Price Variance is exactly offset by the loss in the Trading Account, and no gains or losses will be recognized or sustained. The inventory value of \$17,004.60 will be recovered by the grain department when wheat is issued to the milling department, and subsequently from the customer in the price of flour.

Transactions in the futures market are entered into by milling companies for the purpose of insurance against speculative risk. Perfect protection cannot be obtained, as explained in "Limitations of Hedging". In the above examples it has been assumed that the cash and futures prices have moved in the same direction and by the same amount. This is not always the case by any means; however, the gains or losses due to premium and discount spreads will be small in comparison to possible gains or losses if hedging were not practiced. Any gains or losses caused by the spread between cash and futures prices may be considered as a partial recovery in the cost of grain or the cost of insurance against risk, as the case may be. Speculative gains or losses is another matter and is discussed further.

A comparison of the quantities of grain and flour in the inventory with the quantities shown by the unfilled sales orders

and futures contracts will indicate whether or not the position is balanced. A balanced position does not, however, present conclusive evidence that the policy of hedging has been consistently maintained. Unless purchases and sales of the same quantities are made simultaneously, gains or losses on one transaction will not be compensated by losses or gains on the other.

Assume that a company, anticipating a rise in the market price of grain, purchased 23,500 bushels of cash wheat at \$2.00 per bushel without a corresponding future sale. Subsequently a sale of 10,000 cwts. of flour was effected and the 23,500 bushels of wheat were required to fill the order. When the flour order was received, wheat was quoted at \$2.05 per bushel and the sale of flour was made on this basis. On the date of the inventory, no part of the flour on order has been delivered and the quoted market price of wheat at that time was \$2.10 per bushel.

A comparison of the inventory quantities with unfilled sales orders would indicate a balanced position, but it would be incorrect to conclude therefrom that there had been no speculative gain or loss. The accounting procedure, described previously for the grain department, will make possible the detection, in part at least, of speculative gains or losses as evidenced after a comparison of the Wheat Price Variance and the Trading Account account balances.

The foregoing transactions would have resulted in a debit to Wheat Control of \$47,000.00, the original cost of cash wheat, a credit to Wheat Control of \$48,175.00, the inventory valued at market, \$49,350.00, less loss in unfilled orders, \$1,175.00. The

Wheat Control account balance, \$1,175.00, is then closed to Wheat Price Variance. The credit balance in Wheat Price Variance now indicates the speculative gain of five cents per bushel, representing the difference between the market price of grain at the date of the purchase, \$2.00 per bushel, and its market price at the date of receipt of the flour order, \$2.05 per bushel.

If the company had, simultaneously with the purchase of the cash wheat, sold 23,500 bushels of wheat in the futures market at say, \$2.02 per bushel, and had closed its futures trade on the date of the flour sold by a purchase of futures at, say \$2.07 per bushel, the transactions in the futures market would have resulted in a loss equal to the speculative gain, with the result that the credit balance in Wheat Price Variance and the debit balance in the Trading Account would exactly offset each other.

The above illustration presupposes the purchase of grain without a simultaneous sale and a rising market from the date of the purchase until the date when the hedge was automatically provided by acceptance of an order for flour. During this period, the market price had advanced five cents per bushel and as a result the inventory valuation was increased by the sum of \$1,175.00. The selling price of the flour was based on the market price of the grain on the date the flour order was received, so that the company was not only protected against a future loss, but assuming that the flour was eventually delivered, the company was also assured of a realization of the \$1,175.00 increase in the inventory valuation which had occurred prior to the acceptance of the order for flour. The illustration also presupposes that no part of the

flour had been delivered at the close of the fiscal period, and the question therefore arises as to whether or not the company was justified in taking up the profit of \$1,175.00 and stating the value of the inventory so as to reflect the \$1,175.00 in the asset account.

The fact is that the company hedges the commodity with a view to removing speculative gains or losses, arising from fluctuations in market prices. It may be argued in the case cited that the company realized a profit of \$1,175.00 as, and when, it accepted the order for flour delivery, because, in the ordinary course of events, the wheat would be issued to the milling department at the inventory figure and the amount subsequently realized from the customer in the price of flour. At the closing date, the inventory is protected by flour orders sold on a binding contract; therefore, it seems proper to take up the speculative profit even though it may be argued that it has not been realized, and should be given to the long or short position. If the amount of the unrealized profit or loss due to a long or short position can be determined, an adjustment to the inventory (at market) should be made by increasing or decreasing the Wheat Price Variance. Determination of unrealized profit or loss will necessitate some means of arriving at cost, in the case of a long position, which may involve the assumption that the excess stock represents the most recent purchases. Other assumptions may be as logical, since specific identification is impossible. A short position would indicate that the company has accepted orders for flour, at stated prices, but has not purchased, in either the cash or futures market, the

required quantities of grain. Losses on these sales might be sustained if the price advanced before the purchase of the required grain. In this event it would appear that a reserve should be provided against the possible loss on sales commitments. On the other hand, conservatism would not recognize possible profits resulting from a short position.

It has been indicated that a departure had been made from the conventional practice of valuing wheat and flour stocks at market. It has been stated also that the same end result is accomplished by valuing only wheat in this manner and flour by another method. In order to avoid the shifting of profits from one department to another (between the grain department Wheat Price Variance and the packing department Flour in Process Variance) as between periods, it is herein recommended that flour on hand be valued by determining, the sales value of the wheat equivalent in the flour inventory at the weighted average cost on the date flour was booked, plus additional value added in the manufacturing process. Reference should be made to "Milling and Flour Department Accounting" for an explanation of the value added in manufacture. The value of the wheat equivalent is discussed below. To value flour on this basis will necessitate considering only the gain or loss on flour contracts not covered by flour inventories, when valuing the wheat inventory at theoretical cost. The following example will clarify the method outlined for the valuation of flour and wheat stocks:

1. The inventory at May 31 of Company X:

Grain:		on hand
Grade 1		30,000 bushels
Grade 2		12,000 bushels
Grade 3		1,175 bushels
Grade 4		6,120 bushels
Flour:	on order	on hand
Brand X	4,000 cwts.	2,000 cwts.
Brand Y	6,000 cwts.	4,000 cwts.
Brand Z	20,000 cwts.	10,000 cwts.

2. The grain mixture to produce the various grades of flour is as follows:

Grade of Flour	Grain Mixture Grade	Required Per cent
X (100 per cent flour)	4	75
	3	25
Y (90 per cent patent)	2	80
	4	20
Z (80 per cent patent)	1	70
	2	30

3. The yield of 2.35 bushels of grain mixture is:

100 pounds of 100 per cent flour
 41 pounds of feed

4. Open futures sales contracts at May 31st are for 10,000 bushels of wheat.

5. For purposes of simplification only, the price of grain, by grade, at the time all flour orders were booked, was: \$2.00, \$1.99, \$1.98, and \$1.95 respectively.

Fig. 5. Illustrative Assumptions.

In order to determine the grain position of Company X on

May 31st, the quantities of flour on unfilled orders should be summarized by brands in order to determine the grain requirements. Fig. 6 illustrates such a summary. The grain requirements, by grade, were determined by first referring to the grain requirements tables, Fig. 2, in "The Nature of Accounting". By next referring to the percentage requirement (Assumptions, Fig. 5) of each grade for the particular brand of flour, the requirements by grade were determined. The price per bushel is the price used on the cost sheet at the time flour contracts were booked. Much information from Fig. 6 is used later for purposes other than merely total grain requirements to fill flour orders.

SEGMENTATION BY GRADES

Unfilled Flour Contracts

May 31, 19

Grade of Flour				Grain Requirements by Grade								Grain Requirements by Grade								
Contract Number	Brand X	Brand Y	Brand Z	Bushels	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8	
				Bushels	Price	Amount	Bushels	Price	Amount	Bushels	Price	Amount	Bushels	Price	Amount	Bushels	Price	Amount	Bushels	Price
101	1,000																			
121		2,000																		
130			2,000	4,112.50	\$2.00	\$8,225.00		4,176.00	\$1.99	\$8,310.24				587.5	\$1.99	\$1,163.25	1,762.5	\$1.95	\$3,436.88	2,350.0
132	1,000																			
191		1,000																		
210			12,000	24,675.00	2.00	49,350.00		10,575.00	1.99	21,044.25				587.5	1.98	1,163.25	1,762.5	1.95	3,436.88	2,350.0
215	1,000																			
216		2,000																		
220	1,000																			
250		1,000																		
256			3,000	6,168.75	2.00	12,337.50		2,643.75	1.99	5,261.06				587.5	1.98	1,163.25	1,762.5	1.95	3,436.87	2,350.0
261			3,000	6,168.75	2.00	12,337.50		2,643.75	1.99	5,261.06				587.5	1.98	1,163.25	1,762.5	1.95	3,436.87	2,350.0
Totals	4,000	6,000	20,000	41,125.00		\$82,250.00		30,153.00		\$60,004.47				2,350.0		\$4,653.00	10,182.0		\$19,854.90	83,810.0

Weighted average wheat price when
flour was sold ("Amount" - "Bushels") \$2.00

Fig. 6. Summary, unfilled flour contracts.

The long or short position can now be determined as illustrated in Fig. 7. The results indicate a balanced position.

Long and Short Report

	Long	Short
Cash grain on hand	49,295	
Flour on hand (wheat equivalent in flour inventory)*	44,515	
Unfilled contracts		83,810
Open futures sales		10,000
Total	<u>93,810</u>	<u>93,810</u>

*Details given in Fig. 11.

Fig. 7. Wheat position.

In order to illustrate the method of valuing the inventories of grain and flour, the additional assumptions are made:

1. Market price of cash grain on May 31st:

	Price per bushel
Grade 1	\$2.05
Grade 2	2.04
Grade 3	2.03
Grade 4	2.00

2. Futures quotations on May 31st.

2.09

3. Contract price of open futures sales

2.04

Fig. 8. Additional assumptions.

The operations involved in the computation of the amount of the wheat and flour inventory as of May 31st, are illustrated as follows:

Wheat Inventory at Market			
Grade	Number of Bushels in Inventory	Market Price	Market Value
1	30,000	\$2.05	\$61,500.00
2	12,000	2.04	24,480.00
3	1,175	2.03	2,385.25
4	6,120	2.00	12,240.00
Total	49,295		<u>\$100,605.25</u>

Fig. 9. Wheat inventory priced at market

Open Futures Analysis		
	Per Bushel	Amount
10,000 bushels sold: Price at which futures sale was contracted	\$2.04	\$20,400.00
Price at which wheat may be purchased May 31st to cover sale contract	2.09	<u>20,900.00</u>
Loss on open futures		<u>\$ 500.00</u>

Fig. 10. Analysis of loss on open futures.

GAIN OR LOSS
Unfilled Contracts not Covered
by Flour Inventory

	Grade 1	Grade 2	Grade 3	Grade 4
Market price, May 31st	\$2.05	\$2.04	\$2.03	\$2.00
Weighted average wheat price at date of sale, all un- filled orders (see Fig. 6)	2.00	1.99	1.98	1.95
Loss per bushel market May 31st	\$0.05	\$0.05	\$0.05	\$0.05
Grain requirements (bushels) over flour inventory*	20,562.5	12,988.5	1,175.0	4,569.0
Total loss, unfilled contracts	<u>\$1,028.13</u>	<u>\$649.42</u>	<u>\$58.75</u>	<u>\$228.45</u>
Summary, Gain or Loss, unfilled contracts not covered by flour inventory:				
Grade 1				\$1,028.13
Grade 2				649.42
Grade 3				58.75
Grade 4				228.45
Total loss, unfilled contracts				<u>\$1,964.75</u>

* Details of computations:

	Flour (Cwts.)	Grain Equivalent in Flour (Bushels)			
		Grade 1	Grade 2	Grade 3	Grade 4
Flour on hand:					
Brand X	2,000			1,175	3,525
Brand Y	4,000		8,352		2,088
Brand Z	10,000	20,562.5	8,812.5		
Total grain equivalent in flour inventory		20,562.5	17,164.5	1,175	5,613
Grain requirements, all unfilled flour orders (Fig. 6)		<u>41,125.0</u>	<u>30,153.0</u>	<u>2,350</u>	<u>10,182</u>
Grain requirements in excess of equivalent in flour inventory		20,562.5	12,988.5	1,175	4,569

Fig. 11. Gain or loss unfilled contracts.

Wheat Inventory
May 31, 19____

Wheat priced at market (Fig. 9		\$100,605.25
Deduct:		
Loss on open futures (Fig. 10)	\$500.00	
Loss on unfilled flour contracts (Fig. 11)	1,964.75	2,464.75
Total inventory of wheat at cost		<u><u>\$ 98,140.50</u></u>

Flour Inventory
May 31, 19____

Grain equivalent in flour inventory (Fig. 11):	Bushels	Price (Fig. 6)	Amount
Grade 1	20,562.5	\$2.00	\$41,125.00
Grade 2	17,164.5	1.99	34,157.36
Grade 3	1,175.0	1.98	2,326.50
Grade 4	5,613.0	1.95	10,945.35
Cost of wheat in flour inventory			\$88,554.21
Deduct: estimate offal credit (explained below)			<u><u></u></u>
Difference			\$
Add estimate cost of conversion (explained previously)			<u><u></u></u>
Total flour inventory at estimate cost			<u><u></u></u>

Fig. 12. Wheat and flour inventory valuation.

The "estimate offal credit" would be determined by first computing the weighted average price in all unfilled orders, in the same manner described for computing the weighted average price, of wheat, used in determining the sale price of flour when contracts were booked. The prices, thus determined, multiplied by the

estimate quantity of bran, shorts, and clear expected to be produced, by producing the specific grades and quantities of flour on hand, will constitute the "estimate offal credit". Note that a separate price and quantity must be determined for each class of offal: bran, shorts and clear, to arrive at the total estimated credit for offal.

The illustrated method of valuing wheat and flour stocks avoids specific identification, in the case of wheat, and the problems of matching specific flour contracts against specific wheat stocks, in the case of flour on hand. Matching can become particularly difficult if a situation arises in which certain un-filled orders are not on hand against which to match specific grades of flour on hand. Certain quantities of flour may be produced, in some cases, even though orders for that quality are not, at that moment, on hand.

Justification for the inventory procedure for flour mills is further strengthened by the views expressed by the Bureau of Internal Revenue. The government's position on inventory valuation is that the method used must conform, as nearly as possible, to the best accounting practice in the trade or industry in which the concern operated. In addition, the inventory valuation practice must be consistent from year to year.

PRESENTATION OF FORMAL STATEMENTS

Nature of Financial Statements

The manner of statement presentation will depend to a large extent upon the desires of management, stockholders, and other interested institutions and persons. The accounting system contained herein was prepared from a managerial approach; consequently, the statements presented were prepared in a like manner. It should be noted, however, that much of the information presented in the financial statements, as well as desired additional analysis, could very easily be incorporated in supplementary reports to management, thus eliminating much of the informative detail from the formal financial statements.

Financial statements are the essential product of the underlying procedures of accounting and should be prepared with care and discrimination. Statements are prepared to present the condition or position of the enterprise as of a particular date (the balance sheet) and to depict the process and results of operations for a particular period (the profit and loss statement). The fundamental theory of accounts and their classification in the statements is ably presented by many authors of accounting texts; the theory of accounts peculiar to the milling industry has been discussed in previous sections of this thesis; therefore, this section is limited to the actual presentation of selected accounts (by no means a complete list for any particular firm) in the formal statements. Comments are made, as considered necessary, concerning items or manner of presentation.

Balance Sheet Presentation

The balance sheet is a statement of the financial condition or position of a firm as of a particular date. Fig. 1 illustrates some of the accounts, and their classification, that would appear in a milling company's statement. Most of the items need no explanation, but certain accounts merit attention.

"Advances to Suppliers" may be necessitated by the fact that the actual amount of wheat, at present, cannot be determined since it has not been shipped. The account would appear only if the quantity were not included in the inventory. The amount of the asset would be determined by the extent to which sellers have drawn on the company's account.

"Prepaid Transit" arises from the accounting procedure explained in "Transit Accounting". The amount actually represents prepaid freight charges.

"Margin Deposits" represents the cash deposit made with the broker to cover possible losses on trades due to futures market price fluctuations. The account should be stated at an amount equal to the cash currently on deposit with the broker and no consideration should be given to possible gains or losses on open trades. Theoretically, all possible losses on open trades are already provided for if the company follows a consistent policy of hedging. For example: If, at the date of the balance sheet, the company is long cash wheat it will be short in futures. Since the hedge was placed at the time of the cash wheat purchase, any loss in futures at the balance sheet date (which would decrease the margin deposit if the option were closed) will be offset by the fact

that the cash wheat on hand is worth more by the amount of the possible loss on options. On the other hand, if at the balance sheet date, the company is short cash wheat, it will be long futures. Since the hedge was placed at the time flour was sold, any loss in futures at the balance sheet date is offset by the profit that can be realized by filling the flour contract with lower cost grain.

Footnotes may be considered desirable to reflect the flour, and offal, and futures contracts for future delivery. It is not necessary that these items be shown in the body of the formal statement.

Cost of Goods Manufactured

The statement of cost of goods manufactured is in reality only a supporting statement to the formal profit and loss statement and could be incorporated in this statement itself. The cost of goods manufactured must be determined before the cost of goods sold can be determined. The importance of a complete statement of cost of goods manufactured prompted its presentation separate from the profit and loss statement. Fig. 2 illustrates a manner of presenting the cost of goods sold. Fig. 3 illustrates the profit and loss statement which includes the final amount obtained in the cost of goods manufactured statement.

The purpose of the statement of cost of goods manufactured is to analyze the cost of wheat, other materials, labor, and overhead used in production for the period. It is worthy of note that the statement is presented in such a manner as to show clearly the costs of production on the basis of estimates, adjusted by variances to

arrive at an adjusted actual cost. Costs per unit are presented for several reasons: comparison to prior period's costs, comparison to estimate costs, and as a guide to future price and production policy determination.

A discussion of variances and their disposition is contained in other sections of the thesis, and in particular in "Milling and Flour Packing Department Accounting". Note should be made here, however, that the adjustments in the statement of cost of goods manufactured, are for the total variance, with the exception of "Lost, Spoiled and Defective Units". The adjustments to "Flour Inventory" are for the amount of variance disposed of to that account only.

THE X COMPANY

Balance Sheet

May 31, 19____

Assets

Current Assets:

Cash
Notes and Accounts Receivable
Drafts for Collection
Advances to Suppliers
Accrued Storage
Short Term Investments - cost
Margin Deposits - Options

Inventories:

Wheat - theoretical cost
Flour - theoretical cost
Offal - market
Sacks - cost
Ingredients - cost
Prepaid Expense and Deferred Charges:
Prepaid Transit
Supplies - cost
Interest
Insurance
Advances to Salesmen

Total Current Assets

Fixed Assets:

Land - cost
Buildings - cost
Less Reserve for Depreciation
Machinery and Equipment - cost
Less Reserve for Depreciation

Permanent Investments:

Cash Value of Life Insurance
Bonds - cost less or (plus) amortization

COMPANY X
Statement of Cost of Goods Manufactured
for Year Ended May 31st, 19__

		Cwts.	Per Cwt.
Cost of Wheat Used - Estimate	XXX	XXX	X
Less Offal Credit - Estimate	<u>XX</u>	XX	X
Wheat Cost in Flour Produced - Estimate	XXX	XXX	X
Direct Materials			
Milling Department Estimate	XX	XX	X
Flour Packing Department -			
Estimate	<u>XX</u>	XX	X
Total Direct Materials -			
Estimate	XXX	XXX	X
Direct Labor:			
Milling Department - Estimate	XX	XXX	X
Flour Packing Department -			
Estimate	<u>XX</u>	XXX	X
Total Direct Labor -			
Estimate	XX	XXX	X
Overhead:			
Milling Department - Estimate	XX	XXX	X
Flour Packing Department -			
Estimate	<u>XX</u>	XXX	X
Total Overhead - Estimate	<u>XX</u>	XXX	X
Total Estimate Cost of Flour Purchased		XXXX	XXX
Adjustments:		Under- estimate	Over- estimate
Wheat Quantity Variance	X	XXX	X
Offal Variance		XXX	(X)
Lost Spoiled and Defective			
Units (normal loss)	X	XXX	X
Materials Variance - Milling	X	XXX	X
Materials Variance - Flour			
Packing	X	XXX	X
Labor Variance - Milling		XXX	(X)
Labor Variance - Flour			
Packing	X	XXX	(X)
Overhead Variance - Milling		XXX	(X)
Overhead Variance - Flour			
Packing	<u>X</u>	XXX	X
Total Underestimate	<u>XX</u>	XXX	X
Total Overestimate		<u>XX</u>	XXX
Net Underestimate (Overestimate)	X	XXX	X
Total Adjusted Actual Manufacturing Cost		XXXX	XXX
			XX

Fig. 2. Statement of cost of goods manufactured.

COMPANY X
Profit and Loss Statement
for Year Ended May 31st, 19__

	Cwts.	Per Cwt.
Flour Sales	XXXX	XXX
Cost of Sales:		X
Flour Inventory (beginning)	XX	XXX
Adjusted Actual Manufacturing Cost (Fig. 2)	XXXX	XXX
Total Flour Available for Sale	XXXX	XXX
Less: Flour Inventory (ending)		X
At Estimate	XX	XXX
Add (or Deduct) Adjustments:		
Wheat Quantity Variance	X	XXX
Offal Variance	(X)	XXX
Lost Spoiled and Defective Units (normal loss)	X	XXX
Material Variance - Milling	X	XXX
Material Variance - Flour		
Packing	X	XXX
Labor Variance - Milling	(X)	XXX
Labor Variance - Flour Packing	(X)	XXX
Overhead Variance - Milling	(X)	XXX
Overhead Variance - Flour		
Packing	X	XXX
Total Net Adjustment	X	XXX
Adjusted Actual Flour Inventory	XX	XXX
Adjusted Actual Cost of Sales	XXXX	XXX
Gross Profit on Flour	XX	XXX
Transit Gain or Loss (if applicable)		
Lost Spoiled and Defective Units (normal loss)	X	XXX
Selling Expense:		
Office Selling	XX	XXX
Outside Selling	XX	XXX
Total Selling Expense	XX	XXX
Net Profit on Flour Sales	X	XXX
Grain Department Profit or Loss (see "Grain Department Accounting")	XX	XXX
Add Other Income	X	XXX
Less Other Expense	X	XXX
Net Profit (Loss) from Operations	XX	XXX

Fig. 3. Profit and loss statement.

SUMMARY AND CONCLUSIONS

Summary

In order to properly devise an accounting system for any particular firm, the accountant must first understand the nature of business operations and any peculiarities which require special attention. His general knowledge must be used as a basis for particular applications to specific circumstances.

Milling operations and business practices necessitate special applications of general principles. Selling and buying practices, transit privileges, and hedging operations all require attention.

In a highly competitive field of endeavor, price and production policies are particularly important to profitable operations. In the flour milling industry, cost estimates must be made ahead of production. The reliability of these estimates as compared to actual costs is of utmost importance to continued operations. Variations between actual and estimate costs must be carefully determined and analyzed to predict future results of alternative courses of action.

Price and production policies are inseparable. One is dependent upon the other. Certain quantities will command only certain prices, while certain prices will allow only certain quantities to be sold.

Total revenue is determined by multiplying price by the number of units sold. Total cost is determined by multiplying the cost per unit by the number of units produced. The amount of profit is determined by the excess of total revenue over total cost, and

the most profitable output will be at that quantity where marginal revenue equals marginal cost.

To operate at a point that will maximize profits or minimize losses, some estimates must be made as to quantities and corresponding prices.

The problem of estimating output and margins involves two basic factors: Costs of conversion and the selling price, which will provide the margin for conversion.

Costs of conversion per unit (labor and overhead costs of converting wheat to flour and by-products) will depend upon the level of output. The exact level of output is not known before actual operations begin; therefore, a careful analysis of cost estimates at various levels must be made. This problem may be approached by the use of a differential cost analysis. Differential cost may be defined as the increase or decrease in total cost occasioned by an increase or decrease in units produced and/or sold. Once such an analysis is made, the probable costs of conversion resulting from alternate courses of action can be determined and will serve as a basis for decisions to be made in regard to sales.

Selling price, which provides the margin for conversion, is estimated, at the time flour sales are booked on forward contract, by means of an estimate cost sheet. The cost sheet shows estimates of cost other than the cost of conversion. The difference between the cost sheet cost estimates and the selling price, determines the estimate margin for conversion. A comparison of the estimates of costs of conversion contained in the differential cost analysis and the cost sheet margin for conversion will indicate the estimate

profit or loss on any particular sale.

An estimate of probable results of future operations has thus been determined.

Actual costs and margins will not always parallel estimates. Effective managerial control requires that actual and estimate costs be compared and variances analyzed, in order to test the coordination and control of materials, the efficiency of plant, machinery, and equipment, and as a basis for future price and production policies.

Conclusions

It was contemplated that an estimate cost system, superimposed upon a process cost accounting procedure, would be usable as well as practical for a flour milling concern, the system to involve the accumulation of actual and estimate costs in the ledger accounts which will provide a means of comparing the estimates with actual production costs.

The operation of a process cost system involves first the departmentalization of the productive unit into production and service departments in order that costs and responsibility for costs may be determined. For purposes of discussion, the milling concern was divided into four production departments and four service departments.

Causes of variance between actual and estimate cost must be recognized prior to any proposed method of recording costs by an estimate cost system.

Estimate costs are recorded in the accounts by reference to

the cost sheet which shows estimates of cost other than the cost of conversion and selling, and the differential cost analysis which shows a detailed record of estimate costs of conversion. The cost sheet also shows an estimate margin for conversion as a means of comparison to the estimate costs of conversion shown in the differential cost analysis.

Fig. 1 presents, in summary form, the accounts, and entries therein, necessary to record the actual and estimate costs which are brought together for comparison. Variances between actual and estimate cost are determined by the account balances as indicated. Attention is called to the fact that many ledger accounts were purposely eliminated from the summary. It was deemed unnecessary to include accounts in the outline that did not result in, or present, a variance between actual and estimate cost.

Limitations

No accounting system is proven to be adequate until it has been installed and tested in conjunction with actual operations. Minor revisions are usually found necessary to meet particular difficulties. There are always certain matters that should work in theory, but actual practice may indicate otherwise. Of necessity, this thesis is based, to a large degree, on theory.

The extent of clerical work necessary to operate the proposed estimate cost system may be prohibitive in many instances. The system, however, should lend itself well to systematized machine accounting, which brings to mind that smaller concerns may be able to pool their resources in order to provide the more expensive

sorting and tabulating machines, to be used jointly. Necessary information could be punched on cards at each firm's own office and sent to a centrally located point for sorting and analysis.

Basic records and general accounting theories are ably presented and discussed by many authors of current accounting texts; therefore, certain basic financial and subsidiary records were mentioned only in passing. A complete accounting system would, of course, require that such records be maintained.

No attempt has been made to present all possible reports that may be required by management. The number, length, and detail of managerial reports will depend upon, and vary with, the desires of management.

MILLING DEPARTMENT ACCOUNTS

Wheat in Process

"Actual" cost of wheat used
(from grain department
Wheat Control) Estimate cost of wheat used
 ("actual" quantity, estimate
 price)

--Variance--
(to Wheat Quantity Variance)

Wheat Quantity Variance
 Variance
 from
 Wheat in Process

Materials in Process		Labor in Process		Overhead in Process	
Actual cost	Estimate cost	Actual cost	Estimate cost	Actual cost	Estimate cost

--Variance-- --Variance-- Variance--

BY-PRODUCTS ACCOUNTS

Offal Control

Estimate offal credit (on filled contracts) Offal inventory @ market

Estimate offal credit (in flour on hand) (reverse before next accounting period) Estimate cost of offal sold

Offal Variance

Offal Inventory

Offal Profit and Loss

Variance
-- from --
Offal P & L

Inventory @ market

Estimate cost of offal sold	Sales or
Actual material, labor, and over- head cost	Requisitions from feed department

--Variance--

TRANSIT ACCOUNTS

Transit Control

Excess freight paid to mill
Freight paid out to destination

Freight charged to customers
Transit cancellations
Transit Balance

Transit Gain or Loss

--Variances--

Prepaid Transit
Transit balance

Transit Control

FLOUR PACKING DEPARTMENT ACCOUNTS (continued)

<u>Cost of Goods Sold</u>	<u>Finished Goods</u>
Estimate cost	Estimate cost of goods com- pleted and shipped

Lost Spoiled and Defective Work

Variance
from
Flour in Process

GRAIN DEPARTMENT ACCOUNTS

Wheat Control

Wheat purchases (actual quantity @ actual price)	Issued to mill (actual quantity @ estimate price).
Freight charges (origin to K.C. less mill to K.C.)	Inventory @ market (theoretical cost) Loss due to shrinkage

--Variance--
(to Wheat Price Variance)

Wheat Price Variance

Balance
from
Wheat Control --

Trading Account

Loss (on closed trades only)	Gain	Inventory @ market (theoretical cost)
---------------------------------	------	--

Wheat Inventory

FLOUR PACKING DEPARTMENT ACCOUNTS

Flour in Process

Estimate cost of wheat used (from milling department Wheat in Process)	Estimate cost of wheat (less offal credit), materials, labor, and overhead (from the milling de- partment) in filled flour contracts
Estimate cost of material, labor, and overhead (added in the milling department)	Estimate offal credit (on filled contracts) Estimate offal credit (in flour on hand) Estimate Inventory value (cost of wheat-less offal credit-mate- rials, labor, and overhead add- ed in the milling department)

--Variance--
(to Lost Spoiled and Defective Work)

Materials in Process	Labor in Process	Overhead in Process	Flour Inventory
Actual cost	Estimate cost	Actual cost	Estimate cost
Actual cost	Estimate cost	Actual cost	Estimate cost
--Variance--	--Variance--	--Variance--	

Fig. 1. Summary of accounts and entries.

ACKNOWLEDGMENTS

This study would have been impossible without the generous amount of time, energy, and cooperative spirit contributed by the members of the Flour Mill Accountants' Association and the many firms and personnel in the flour milling industry for which the author is deeply appreciative.

The author gratefully acknowledges the constructive work and assistance of Professor Harry M. Stewart and Dr. Leonard W. Schruben of the Department of Economics and Sociology, and Dr. J. A. Shellenberger, head of the Department of Milling Industry, Kansas State College, in the general preparation and content of this thesis.

BIBLIOGRAPHY

Clark, Fred E.
Principles of marketing. New York: Macmillan, p. 426-427. 1933.

Linnenkohl, K. E.
Daily report basis for planning and control in the flour milling industry. Unknown.

McCreight, Robert R.
Flour milling costs. N. A. C. A. Bulletin, Volume 23, Number 3. Section 1. October 1, 1941.

McKibben, Ralph
Valuation of flour mill inventories. N.A.C.A. Bulletin, May 1, 1947.

Neuner, John J.
Cost accounting. Chicago: Richard D. Irwin, Inc., p. 434-440. 1949.

Nutting, R. E.
Daily position records in flour mill accounting. Journal of Accountancy, p. 430-431. November, 1949.

Pelej, Joseph
Valuation of flour mill inventories. Journal of Accountancy, July, 1939.

Unknown.
Cost accounting manual for small mills. Chicago: Millers' National Federation. 50 p. 1939.

Willcox, Russell S.
Cost accounting: Chicago: Business Publications Company, p. 198-202. 1934.

ACCOUNTING AND ECONOMIC ASPECTS OF THE
FLOUR MILLING INDUSTRY

by

ROBERT ARTHUR ANDERSON

B. S., Kansas State College
of Agriculture and Applied Sciences, 1944

ABSTRACT OF THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics and Sociology

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1951

Field of Study

There are many different types of flour mills producing many different types of flour. This particular study, although many of the problems and principles involved are applicable to other types of mills, is confined to the industry engaged in the production of wheat flour.

The study is further confined to the wheat flour production industry in Kansas. The principles and practices involved are identical in many respects and equally applicable to the industry as a whole, varying only in minor details in other states of the United States of America.

Particular emphasis is placed on the peculiarities and problems of the industry as concerns accounting records and controls necessitated by the economic aspects of the industry.

Purpose and Objectives

The purpose and object of the study is to develop accounting records and controls which will aid in the solution of economic problems of management, with particular reference to price and production policy.

Economics is defined in Webster's dictionary as, "The science that investigates the conditions and laws affecting the production, distribution, and consumption of wealth...." Accounting is defined by the same source as, "The art or system of making up or stating accounts; the body of principles underlying the keeping and explanation of business accounts. Accounting draws from the results furnished by the bookkeeper, inferences as to the condition

and conduct of the business.¹ Accounting supplies a kit of tools that may be used to aid in the science of investigating the conditions and laws affecting the production and distribution of wealth. The problem is to select and adapt the proper tools for the particular job requirements.

Plan and Method of Approach

The lack of any considerable amount of published material on the subject of accounting technique for the flour milling industry leaves but one alternative in accumulating sufficient information: that of personal interviews with men in the industry. The selection of persons and firms contacted was made with only one purpose in mind: cooperation in obtaining the information desired.

The results of the study are an accumulation of knowledge from personal interviews; published, typewritten, and mimeographed material from whatever sources available. All written information is cited in the bibliography at the end of the thesis.

Summary of Problem

In order to properly devise an accounting system for any particular firm, the accountant must first understand the nature of business operations and any peculiarities which require special attention. His general knowledge must be used as a basis for particular applications to specific circumstances.

¹ A Merriam-Webster, Webster's New Collegiate Dictionary (Springfield, Mass.: G. and C. Merriam Company, 1949).

Milling operations and business practices necessitate special applications of general principles. Selling and buying practices, transit privileges, and hedging operations all require attention.

In a highly competitive field of endeavor, price and production policies are particularly important to profitable operations. Variations between actual and estimate costs must be carefully determined and analyzed to predict future results of alternative courses of action.

Price and production policies are inseparable. One is dependent upon the other. Certain quantities will command only certain prices, while certain prices will allow only certain quantities to be sold.

Total revenue is determined by multiplying price by the number of units sold. Total cost is determined by multiplying the cost per unit by the number of units produced. The amount of profit is determined by the excess of total revenue over total cost, and the most profitable output will be at that quantity where marginal revenue equals marginal cost.

To operate at a point that will maximize profits or minimize losses, estimates must be made as to quantities and corresponding prices.

The problem of estimating output and margins involves two basic factors: (1) Costs of conversion and (2) the selling price, which will provide the margin for conversion.

Conclusions

Costs of conversion per unit (labor and overhead costs of converting wheat to flour and by-products) will depend upon the level of output. The exact level of output is not known before actual operations begin; therefore, a careful analysis of cost estimates at various levels must be made. This problem may be approached by the use of a differential cost analysis. Differential cost may be defined as the increase or decrease in total cost occasioned by an increase or decrease in units produced and/or sold. Once such an analysis is made, the probable costs of conversion resulting from alternate courses of action can be determined and will serve as a basis for decisions to be made in regard to sales.

Selling price, which provides the margin for conversion, is estimated, at the time flour sales are booked on forward contract, by means of an estimate cost sheet. The cost sheet shows estimates of cost other than the cost of conversion. The difference between the cost sheet estimates and the selling price, determines the estimate margin for conversion. A comparison of the estimates of costs of conversion contained in the differential cost analysis and the cost sheet margin for conversion will indicate the estimate profit or loss on any particular sale.

An estimate of probable results of future operations has thus been determined.

Actual costs and margins will not always parallel estimates. Effective managerial control requires that actual and estimate costs be compared and variances analyzed, in order to test the

coordination and control of materials, the efficiency of plant, machinery, and equipment, and as a basis for future price and production policies.

It was contemplated that an estimate cost system, superimposed upon a process cost accounting procedure, would be usable, as well as practical, for a flour milling concern, the system to involve the accumulation of actual and estimate costs in the ledger accounts which will provide a means of comparing the estimates with actual production costs.

The operation of a process cost system involves first the departmentalization of the productive unit into production and service departments in order that costs and responsibility for costs may be determined. For purposes of discussion, the milling concern was divided into four production departments and four service departments. The production departments are: grain department, milling department, flour packing department, and by-product packing department. The service departments are: traffic department, maintenance department, general office, and selling department.

Causes of variance between actual and estimate cost must be recognized prior to any proposed method of recording costs by an estimate cost system. They may be outlined as follows:

1. The ownership of grain.

A. Quantity

- a) Weight
- b) Grade

B. Position

- a) Quantity
- b) Type
- c) Price

2. The production of flour and by-products.

A. Yield

- a) Quantity
- b) Grade
- c) Price

B. Feed

- a) Quantity
- b) Type
- c) Price

C. Clears

- a) Quantity
- b) Grade
- c) Price

3. Miscellaneous causes

- A. Freight cost
- B. Package costs
- C. Ingredient costs
- D. Labor and overhead costs

Any one, or any combination of the above variables, can cause a discrepancy between actual results and estimate costs.

Estimate costs are recorded in the accounts by reference to the cost sheet which shows estimates of cost other than the cost of conversion and selling, and the differential cost analysis which shows a detailed record of estimate costs of conversion. The cost sheet also shows an estimate margin for conversion as a means of comparison to the estimate costs of conversion shown in the differential cost analysis.

Fig. 1 presents, in summary form, the accounts, and entries therein, necessary to record the actual and estimate costs which are brought together for comparison. Variances between actual and estimate cost are determined by the account balances as indicated.

Attention is called to the fact that many ledger accounts were purposely eliminated from the summary. It was considered unnecessary to include accounts in the outline that did not result in, or present, a variance between actual and estimate cost.

Limitations

No accounting system is proven to be adequate until it has been installed and tested in conjunction with actual operations. There are always certain matters that should work in theory, but actual practice may indicate otherwise. Of necessity, this thesis is based, to a large degree, on theory.

The extent of clerical work necessary to operate the proposed estimate cost system may be prohibitive in many instances. The system, however, should lend itself well to systematized machine accounting, which brings to mind that smaller concerns may be able to pool their resources in order to provide the more expensive sorting and tabulating machines, to be used jointly. Necessary information could be punched on cards at each firm's own office and sent to a centrally located point for sorting and analysis.

Basic records and general accounting theories are ably presented and discussed by many authors of current accounting texts; therefore, certain basic financial and subsidiary records were mentioned only in passing. A complete accounting system would, of course, require that such records be maintained.

No attempt has been made to present all possible reports that may be required by management. The number, length, and detail of managerial reports will depend upon, and vary with, the desires of management.

GRAIN DEPARTMENT ACCOUNTS

Wheat Control

Wheat purchases (actual quantity @ actual price)	Issued to mill (actual quantity @ estimate price)
Freight charges (origin to K.C. less mill to K.C.)	Inventory @ market (theoretical cost)
	Loss due to shrinkage

--Variance--
(to Wheat Price Variance)

Wheat Price Variance

Balance
from
Wheat Control --

Trading Account	
Loss (on closed trades only)	Gain

Wheat Inventory	
Inventory @ market (theoretical cost)	

FLOUR PACKING DEPARTMENT ACCOUNTS

Flour in Process

Estimate cost of wheat used (from milling department Wheat in Process)	Estimate cost of wheat (less offal credit), materials, labor, and overhead (from the milling de- partment) in filled flour contracts
Estimate cost of material, labor, and overhead (added in the milling department)	Estimate offal credit (on filled contracts) Estimate offal credit (in flour on hand) Estimate inventory value (cost of wheat-less offal credit-mate- rials, labor, and overhead add- ed in the milling department)

--Variance--
(to Lost Spoiled and Defective Work)

Materials in Process	Labor in Process	Overhead in Process	Flour Inventory
Actual cost	Estimate cost	Actual cost	Estimate cost

--Variance-- --Variance-- --Variance--

Fig. 1. Summary of accounts and entries.

MILLING DEPARTMENT ACCOUNTS

Wheat in Process

"actual" cost of wheat used
from grain department
Wheat Control)

Estimate cost of wheat used
("actual" quantity, estimate
price)

--Variance--
(to Wheat Quantity Variance)

Wheat Quantity Variance

Variance

--
from
Wheat in Process

Materials in Process	Labor in Process		Overhead in Process	
Actual	Estimate	Actual	Estimate	Actual
cost	cost	cost	cost	cost
--Variance--		--Variance--		--Variance--

BY-PRODUCTS ACCOUNTS

Offal Control

Estimate of offal credit (on filled contracts)	Offal inventory @ market	
Estimate of offal credit (in flour hand) (reverse before next accounting period)	Estimate cost of offal sold	

Offal Variance	Offal Inventory	Offal Profit and Loss	
Variance	Inventory @ market	Estimate cost of offal sold	Sales or Requisitions from feed department head cost
from --		Actual material, labor, and over-	
Offal P & L		head cost	
			--Variance--

TRANSIT ACCOUNTS

Transit Control

Less freight paid to mill Bought paid out to destination	Freight charged to customers Transit cancellations	
	Transit Balance	

Transit Gain or Loss	Prepaid Transit	
Balance from --	Transit Balance	

Transit Control FLOUR PACKING DEPARTMENT ACCOUNTS (continued)

of Goods Sold	Finished Goods	Lost Spoiled and Defective Work	
Actual cost	Estimate cost of goods com- pleted and shipped	Variance from Flour in Process	
		--	